



**OPTIONS FOR ORGANIZING THE TANKER
AIRLIFT CONTROL CENTER FLIGHT
DISPATCH FUNCTION: AN
EXPLORATORY CONCEPT STUDY**

GRADUATE RESEARCH PROJECT

Jeffrey A. Sheppard, Major, USAF

AFIT/GMO/ENS/00E-10

**DEPARTMENT OF THE AIR FORCE
AIR UNIVERSITY**

AIR FORCE INSTITUTE OF TECHNOLOGY

Wright-Patterson Air Force Base, Ohio

APPROVED FOR PUBLIC RELEASE; DISTRIBUTION UNLIMITED.

The views expressed in this graduate research project are those of the author and do not reflect the official policy or position of the United States Air Force, Department of Defense, or the U. S. Government.

OPTIONS FOR ORGANIZING THE TANKER AIRLIFT CONTROL
CENTER FLIGHT DISPATCH OPERATION: AN EXPLORATORY CONCEPT
STUDY

Presented to the Faculty of the Graduate School of
Engineering and Management
Air Force Institute of Technology
Air University
Air Education and Training Command
In Partial Fulfillment of the Requirements for the
Degree of Master of Air Mobility

Jeffrey A. Sheppard, B.A.

Major, USAF

June 2000

APPROVED FOR PUBLIC RELEASE; DISTRIBUTION UNLIMITED.

Acknowledgements

First and foremost, I thank my wife and my children
Without their unwavering support and untold patience, this project would not have been possible.

From a professional standpoint, I thank my sponsors for their assistance. Major General John Becker of the United States Transportation Command provided the initial vision for my project. Brigadier General Mike Wooley, Commander of the Air Mobility Command Tanker Airlift Control Center contributed his candid views and senior-level mentorship. I also express my sincerest appreciation to Lieutenant Colonel Glenn Hanbey of the Tanker Airlift Control Center. He sacrificed much of his valuable time specifically to assist me with my project. He unselfishly served as a sounding board for my ideas and pointed me towards countless sources of valuable research data.

I'd also like to acknowledge the Air Force Institute of Technology staff for their support. As my faculty advisor, Dr. William Cunningham offered his valuable feedback and guidance. Dr. David Vaughan provided excellent instruction on organizational and content issues to our entire Advanced Study of Air Mobility Class.

Finally, I extend my appreciation to Janet Missildine of the General Ronald R. Fogleman Library for her superb research assistance and Senior Master Sergeant Yocasta "Yogi" Garcia for her tireless efforts in administering the Advanced Study of Air Mobility Program. These are just two of the many outstanding professionals who make the Air Mobility Warfare Center the world-class organization that it is.

Table of Contents

	Page
Acknowledgements.....	ii
List of Figures.....	v
List of Tables.....	vi
Abstract.....	vii
I. Introduction.....	1
Theoretical Background.....	1
General Issue.....	1
Problem Statement.....	5
Importance of Research.....	6
Research and Investigative Questions.....	7
Organization.....	8
II. Historical Evolution.....	9
Theoretical Background.....	9
The Early Years.....	9
The TACC Today.....	12
Into the Future: Global Air Traffic Management and Mobility 2000.....	15
Mission Management Versus Flight Dispatch.....	17
III. Organizational Alternatives.....	21
Theoretical Background.....	21
The Benchmarks.....	22
TACC Structure.....	22
The Airline Operations Center.....	24
Organizational Options for the TACC Flight Dispatch Operation.....	28
Option 1: Geographic Orientation.....	28
Option 2: Product Line Orientation.....	30
Option 3: MDS Orientation.....	32
Options and Competencies.....	33
Chapter Conclusion.....	36
IV. Evaluating the Alternatives.....	37

Theoretical Background.....	37
Evaluation of Alternatives.....	39
Program Goal Approach: Goal Selection.....	39
Program Goal Approach: Goal Evaluation.....	40
Goal 1: Safety.....	40
Goal 2: Efficiency and effectiveness.....	42
Goal 3: The virtual crewmember.....	47
Program Goal Approach: Summary.....	53
V. Selecting the Best Alternative.....	56
Theoretical Background.....	56
Alternative Selection Process.....	57
The Process Applied.....	60
Summary and Conclusions.....	61
Acronyms.....	64
Bibliography.....	65
Vita.....	68

List of Figures

2-1. Mission Life Cycle.....	12
2-2. TACC Cell Areas of Responsibility.....	14
3-1. XOC Core Floor Plan.....	23
3-2. Airline Operations Center at United Airlines.....	25
3-3. Dispatcher Workstation at American Airlines.....	26
3-4. Geographically Based IFM Facility.....	29
3-5. Product Line Based IFM Facility.....	31
3-6. MDS Based IFM Facility.....	33
4-1. Decision Tree for Evaluating Alternatives.....	37

List of Tables

2-1. Job Description of Aircraft Dispatcher/Flight Manager.....	18
5-1. Summary of Preferred Organizational Structure by Program Goal.....	61

Abstract

The Tanker Airlift Control Center (TACC) is the central execution agency for determining and tasking all AMC operational mission requirements. Central to the TACC is the mission management function that organizes, plans, directs and controls AMC airlift and air refueling missions worldwide. As it moves into the future, TACC must adopt emerging capabilities in communication, navigation, and surveillance to allow it to continue to freely operate throughout the world air traffic system. To position itself for future operations, the TACC has implemented the Mobilty 2000 initiative, a key element of which is the planned introduction of Integrated Flight Management, or IFM. Central to IFM will be the introduction of the flight dispatch function—a proactive, real time command and control system patterned after that used by commercial airlines. At this time, TACC leaders are unsure whether to organize the future flight dispatch operation based on geography, product line, or aircraft type. This Graduate Research Project explores these organizational options, and specifically seeks to identify criteria that TACC can use in deciding on a final organizational structure. To assist in this process, it evaluates the organizational issues in the context of the Rational Decision Making Model as discussed by Griffin.

Chapter 1 of the writing introduces the issues under examination. Chapter 2 describes the historical development of the TACC as well as future challenges and how these evolved into the need to introduce Integrated Flight Management and the flight dispatch concept. Chapter 3 first overviews the current TACC command and control

operation. Next, it contrasts this operation with its commercial equivalent, the Airline Operations Center. Finally, it introduces alternative organizational structures for the TACC flight dispatch operation based on geography, product line, and aircraft type. Chapter 4 evaluates the alternative structures in the framework of the Rational Decision Making Model as discussed by Griffin, and Whyte's employment of multiple decision frames. To aid in this evaluation, it selects three far-reaching goals of the future flight dispatch operation—safety, efficiency and effectiveness, and creating a virtual crewmember—and considers them decision frames, or points of reference from which a final choice of organizational structure should be made. Through qualitative evaluation, preferred organizational structures are presented from each point of reference. Chapter 5 includes process recommendations for selecting a final organizational structure for the TACC flight dispatch operation. Using this process, it formulates a recommendation of its own based on the evaluations presented in Chapter 4. Chapter 5 concludes that based on the decision criteria and evaluation methods used in the study, a product line based system with geographic subdivisions is the preferred organizational structure for the future TACC flight dispatch operation. Additionally, it recommends that as TACC leaders move closer to a final organizational decision, they give greater weight to the application of the discussed decision making frameworks than to the outright adoption of any specific proposal.

OPTIONS FOR ORGANIZING THE TANKER AIRLIFT CONTROL CENTER FLIGHT DISPATCH OPERATION: AN EXPLORATORY CONCEPT STUDY

I Introduction

Theoretical Background

Leaders and managers like to think of themselves as rational decision makers. The classical decision making model states that when faced with a decision, the decision maker should obtain complete and perfect information about the situation and possible alternatives, eliminate uncertainty, and evaluate all aspects of the decision logically and rationally. Griffin contends that these conditions rarely if ever exist. He proposes that managers who really want to approach a decision rationally and logically should follow the steps in the rational decision making model (Griffin, 1999:269). This Graduate Research Project (GRP) explores a current decision facing the Air Mobility Command Tanker Airlift Control Center in the framework of the Rational Decision Making Model as discussed by Griffin.

General Issue

The Tanker Airlift Control Center, or TACC, is the functional name for the highest level in the Air Mobility Command (AMC) command and control (C2) system. The center serves as the central execution agency for determining and tasking all AMC

operational mission requirements. Central to the TACC is the mission management function, which organizes, plans, directs, and controls AMC airlift and air refueling missions worldwide. This critical function is carried out through specially trained mission managers who man the TACC 24 hours a day and provide the vital link between the center and aircraft operating worldwide in the AMC system (AMCI 10-202, 1999).

The TACC was created in April, 1992 in the wake a massive downsizing and reorganization effort throughout the Department of Defense. As part of this effort, the Air Force combined the assets and personnel of Tactical Air Command (TAC), Strategic Air Command (SAC) and Military Airlift Command (MAC) into two new commands: Air Combat Command (ACC) and Air Mobility Command (AMC). Additionally, one entire echelon of command—the air division—was eliminated, and numbered air force (NAF) headquarters staff sizes were drastically reduced. The TACC was initially organized to centralize and maximize the efficiency of the command and control resources that previously fell under the air divisions and NAFs. The newly-formed organization was responsible to the commander of AMC for scheduling and executing tanker and transport aircraft and associated subsystems like logistics and transportation, weather, computers, and intelligence support (Leland, 1992:25).

As the 1990's progressed, TACC became synonymous with command and control for all AMC airborne assets. Simultaneously, AMC senior leadership began considering how it should react to emerging technological and geo-political changes that would affect its operations in the 21st Century. Geopolitically, the command expects a national military strategy that will continue to require rapid response to chaotic regional, national, and ethnic crisis'. In light of a drastically reduced overseas force structure, the nation's

ability to respond to potential threats around the world can only be maintained through a robust global mobility capability, achieved through the optimized use of military airlift and air refueling (AMMP, 1999:2-7). Technologically, the command must adopt emerging capabilities in communication, navigation and surveillance. Currently, AMC aircraft share airspace around the world with commercial airlines. Aviation's ever-expanding role, however, has led to a proliferation of air traffic that is putting ever-greater strains on the world air traffic system. As a result, the International Civil Aviation Organization (ICAO) and the Federal Aviation Administration (FAA) plan to adopt new air traffic management concepts that will place more aircraft into a given amount of airspace. In order to operate and maintain safety in these more congested skies, AMC (as well as civilian) aircraft will be required to acquire equipment that provides increased communication capability and navigational accuracy (Rubalcaba, 1997:18).

In an effort to position itself for future operations, TACC, in 1998, undertook a modernization initiative known as "TACC 2000." The initiative was later renamed "Mobility 2000," often abbreviated "M2K," after its framers pointed out that it would have far-reaching implications extending well beyond the walls of the TACC. The stated goal of M2K is to:

Revolutionize the command's C2 data flow connectivity, data processing, data base management, and information display capabilities to position the command for more efficient and responsive air mobility operations....The M2K vision is to create an environment that facilitates global connectivity between AMC and all AMC mission aircraft, regardless of location or mission. [M2K] will incorporate new technologies and processes, like those being developed within global air traffic management and flight dispatch operations to efficiently exchange data with AMC aircraft, FAA and military C2 systems (Williams, 1999).

The M2K initiative has been broken down into three key capabilities collectively known as the “M2K Triad:” aircraft equipment, communications channels, and integrated flight management. This Graduate Research Project (GRP) focuses on one particular aspect of the integrated flight management (IFM) capability, the flight dispatch function

Integrated Flight Management (IFM), as stated by AMC, is “an overarching, integrating vehicle across AMC forming the foundation for a closer link between CONUS, European, and Pacific AMC resources. It is the basis of an improved Command and Control (C2) capability that allows for more effective planning, communications and resource (aircraft, crews and payload) visibility and utilization” (Williams, 1999). IFM initiatives will focus on enhancing global connectivity by introducing changes to numerous C2 systems and the conversion of the current mission manager system to a flight dispatch system patterned after that used by commercial airlines. According to the TACC vision:

Real time, global connectivity, paired with a TACC flight dispatch operation will be a force multiplier. It will put the full complement of TACC resources at the aircrew’s fingertips. Closer coordination and shared responsibilities between the crew and dispatcher will create improved efficiencies in areas such as ground time, route and alternate selection, and weather avoidance. These efficiencies will result in significant dollars saved across the command, but more importantly they will result in safer flight operations (Williams, 1999).

In 1998, AMC contracted the Federal Systems Integration and Management Center (FEDSIM) to take an in-depth look at current TACC operations and define the requirements for implementation of IFM. The findings of the FEDSIM study are summarized in a 96-page document first released in April, 1999. The FEDSIM findings revolve primarily around the statement that “a dispatch-like function (flight manager)

should be implemented at the core of IFM” (FEDSIM, 1999:7-2). Following the FEDSIM study, AMC made a decision to proceed with the development and implementation of a flight dispatch operation, beginning with a small-scale pilot program to be initiated in the year 2000.

Problem Statement

As of this writing, the flight dispatch pilot program is poised to begin operations, and AMC is aiming to have a full-fledged dispatch operation in place by 2003. As the dispatch operation is phased in, many challenges will undoubtedly surface. Brigadier General Michael Wooley, TACC Commander, and other TACC senior leaders are already addressing major implementation issues such as personnel selection and equipment acquisition. A specific area of concern that has not yet been addressed was presented by Major General John Becker, TACC commander from 1999 to 2000, when he asked: “should AMC organize its flight dispatcher/flight manager function by MDS, [geographic] region or product line?” (Becker, 1999). General Becker’s statement forms the central focus of this GRP. For clarification, “MDS” refers to “mission, design, series” or in layman’s terms, aircraft type. “Product line” can be otherwise described as mission type. In the context of this GRP, organization of the flight dispatch function is discussed primarily as it relates to the grouping of jobs among flight dispatchers.

Organizing involves deciding how best to group organizational activities and resources. The organizational process can be broken into six basic building blocks: designing jobs, grouping jobs, establishing reporting relationships between jobs, distributing authority among jobs, coordinating activities between jobs, and

differentiating between positions (Griffin, 1999:324). The issues discussed in this GRP center around the second of these building blocks. Griffin calls the process of grouping jobs “departmentalization” (Griffin, 1999:330). This is essentially the challenge TACC is facing as it considers how to properly group a limited number of dispatchers. Thus, throughout this GRP the terms *organize*, *organization* and *organizational*, when discussed in the context of the TACC flight dispatch function, relate specifically to departmentalization issues.

Importance of Research

The introduction of a flight dispatch operation within the TACC represents a major commitment in terms of time, personnel, and financial resources. Particularly in an era of limited defense budgets and decreasing personnel pools, it is critical that we use these resources as efficiently as possible. Additionally, the new system will bring with it an expectation on the part of various stakeholders that it yields tangible results that improve the effectiveness of AMC’s worldwide operations. Successful organizations are both efficient and effective (Griffin, 1999:8). From a departmentalization standpoint, the flight dispatch operation will build on the way TACC is structured now, but from a functional perspective, it will provide drastically improved capability. To be fully successful, as this restructuring takes place it must yield a new operation that is both efficient and effective.

This GRP discusses different organizational options and evaluates which of these might provide the optimal balance between efficiency and effectiveness. The issue of optimal organizational structure for any organization is largely qualitative in nature. The

ultimate structural choice will depend on a myriad of interdependent, and perhaps conflicting factors, most of which cannot be readily evaluated in a quantitative manner. Thus, finding a statistically-based “single best” answer to the organizational question falls outside the intent and scope of this GRP. Instead, this project focuses on identifying and evaluating those factors that the TACC leadership should consider as it seeks to answer General Becker’s question. It will develop a qualitative recommendation that should warrant consideration. More importantly though, the decision making processes presented should be a catalyst for further discussion—discussion that will ultimately lead to a final choice of organizational structure.

Research and Investigative Questions

The primary research question addressed in the GRP is stated as follows:

What criteria should control the choice of organizational structure for the Tanker Airlift Control Center flight dispatch operation?

The following investigative questions relate to the Rational Decision Making Model as discussed by Griffin, and should ultimately provide an answer to the research question stated above:

1. How did the current TACC organizational structure and proposed flight dispatch function evolve?
2. What are the alternatives for TACC organizational structure under the Integrated Flight Management concept?
3. How should these alternatives be evaluated?

Organization

This GRP has five chapters. Chapter 1 introduces the topic and presents the research and investigative questions. Chapter 2 investigates the historical evolution of the current TACC command and control system and its organizational structure. It follows TACC from its founding through the present day. It aims to lay the historical foundation for further analysis. Chapter 3 looks to the future and examines alternative organizational structures the TACC could adopt as it transitions to the IFM system. It considers the organization of commercial dispatch systems and looks for elements that might be useful to apply at the TACC. The chapter presents the structure recommended by the FEDSIM study as one organizational alternative, and then modifies it to create other alternatives. For each alternative, the chapter discusses which competencies would be most greatly enhanced. Chapter 4 evaluates the alternative organizational structures within the framework of Griffin's decision tree for evaluating alternatives and Whyte's employment of multiple decision frames. Chapter 5 discusses methods for selecting the best alternative under the rational decision making process. Finally, it applies this method to the alternatives identified in Chapters 3 and 4 and presents conclusions and recommendations.

II Historical Evolution

Theoretical Background

The first step in the rational decision making process is recognizing and defining the decision situation. In Griffin's words: "there must be some stimulus or spark to initiate the process." An important part of recognizing a problem is the need to define precisely what it is. The manager must develop a full understanding of the problem, its causes, and its relationships to other factors through careful analysis of the situation (Griffin, 1999:270). This chapter seeks to develop a full recognition and understanding of the problems facing the TACC as it responds to changes in both the AMC mission and the global air traffic environment. It begins this process by tracing the development of the TACC from its earliest years to the present day. Next, it projects present developmental trends into the future. Against this backdrop, it identifies challenges the TACC will face as it strives to provide effective command and control of AMC assets in an increasingly restrictive global air traffic environment.

The Early Years

The Tanker Airlift Control Center was officially activated in April, 1992. The initial tasking to create a TACC was given by then Commander in Chief of Military Airlift Command General Hansford T. Johnson. General Johnson selected Colonel Daryl L. Bottjer to head the team that developed the initial organizational structure and operational procedures for the new control center. As the team began its work, General Johnson's only rule was that it create a command and control system more efficient than

what was in place at the time. To create the most efficient organization possible, the team put together a matrix which listed every position in the TACC, and then listed the communication and information systems each person needed to perform his or her designated function (Leland, 1992:26).

In July, 1992, Colonel Bottjer identified the most difficult challenges facing the newly formed TACC as a shortage of personnel, a lag in technological capability, and organizational issues stemming from the necessity to merge the command and control capabilities of the 21st and 22nd Air Forces. In 1992, personnel shortages were becoming common throughout the Air Force, and the TACC was no exception. Making more efficient use of fewer people is as much a necessity in the TACC today as it was in 1992. Technological capability was ballooning at a very rapid rate in 1992, and Col Bottjer was eager to leverage this technology to increase TACC's command and control capability. But before this leveraging could take place, the organization had to overcome a technological gap that existed between computer assets that were acquired from the former Military Airlift Command and Strategic Air Command. The TACC was able to overcome this challenge as well (Leland, 1992:26), and today it is depending on the robust application of leading-edge technology to accomplish its goals under M2K.

From an organizational standpoint, TACC was departmentalized based on geographic areas roughly paralleling spans of control that previously fell under the purview of Military Airlift Command's 21st and 22nd Air Forces. Aircraft assigned to 21st Air Force were controlled by the "East Cell" and those falling under 22nd Air Force were controlled by the "West Cell." Under Military Airlift Command (MAC), airlift wings and their associated aircraft were assigned to numbered air forces (NAF's) based on

geographic location, with the Mississippi River serving as a de facto boundary between the two areas of responsibility. By Colonel Bottjer's admission, having the TACC cells mirror NAF areas of responsibility initially created an unintentional "invisible wall" at the Mississippi River (Leland, 1992:26). This "wall" hampered effective communication and smooth, positive command and control of assets.

An added organizational challenge arose when the TACC began to assimilate command and control of KC-135 and KC-10 air refueling aircraft (tankers) previously assigned to Strategic Air Command (SAC). Under SAC, the KC-135 fleet, which accounted for approximately 90 percent of Air Force air refueling assets, was allocated among more than 20 bases throughout the command. The majority of KC-135 squadrons were attached to a parent B-52 or B-1 bomb wing. KC-10 assets were allocated among three bases, with one unit attached to a parent bomb wing and two units forming stand-alone air refueling wings. With the deactivation of SAC came a major consolidation of tanker assets under AMC. In 1992 AMC initially allocated its newly gained tanker assets among five air refueling wings, each having two or more geographically separated operational tanker units. At this time, all AMC tanker assets, regardless of location, were assigned to 15th Air Force (USAF Almanac, 1991, 1992, 1995). As a result, TACC was faced with assimilating geographically allocated airlift aircraft and functionally allocated tanker aircraft under one command and control system.

During TACC's initial standup period, AMC was a newly created command. While AMC drew assets from two major air commands (MAC and SAC), the new organization most closely mirrored MAC. Given the geography-based allocation of assets under the 21st the 22nd Air Forces, TACC's initial choice to organize its command

and control cells along geographic lines seems to have been logical. According to Colonel James Rummer, TACC Director of Command and Control, the organization's current command and control structure is a holdover from 1992 when the original NAF oriented "cells" were created (Rummer, 2000). This is not to say the structure has necessarily outlived its usefulness—it merely begs a question: do the advantages of a geography based system that were evident in 1992 still apply today?

The TACC Today

Today the TACC command and control system is designed to support the AMC mission life cycle, which takes every mission from identification of a requirement through the planning, scheduling and execution phases. This life cycle is illustrated in Figure 2-1.

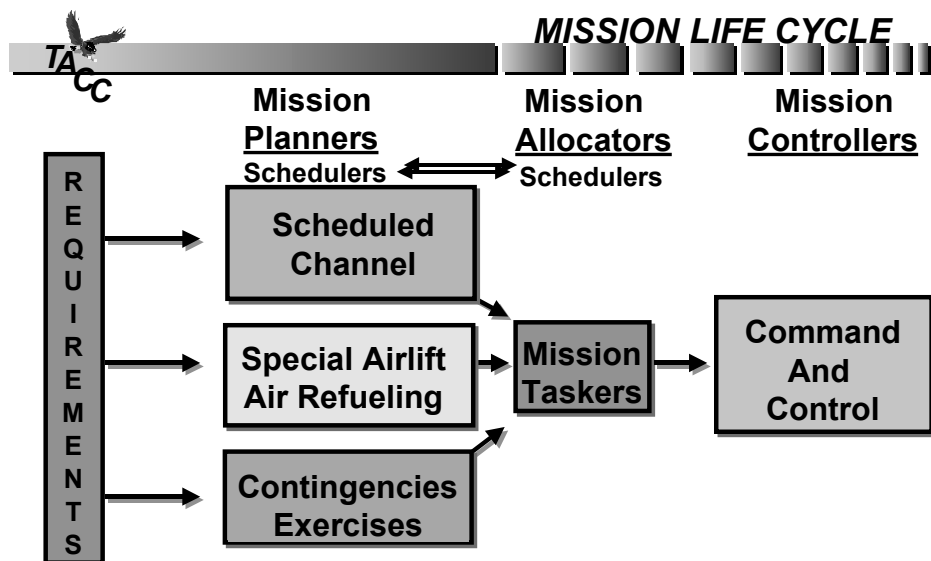


Figure 2-1 (Source: TACC Overview Briefing)

The requirement identification and validation process, illustrated at the far left of the figure, falls outside of the scope and intent of this GRP, so a brief discussion of the

mission life cycle begins with the assumption that a validated requirement has been received by the TACC. Once this has been accomplished, planning cells build an appropriate mission. The planning function is organized along product lines, with specialized planning cells dedicated to scheduled channel missions, special airlift and air refueling missions, and contingencies and exercises.

Once a specific mission has been planned, the mission allocation or tasking function begins. This function can best be summarized as the process of “optimizing crew and aircraft assignment to meet AMC taskings.” Not surprisingly, in today’s environment of high operations tempo, many units feel they are routinely overtasked. Thus, this function can be the source of much contention among operational aircrews throughout the command. The mission allocators take an average of 800 strategic airlift missions, 500 tactical airlift missions, and 2,300 air refueling missions per month, and utilizing TACC’s streamlined tasking authority, allocate them to AMC operational wings. Because taskings identify a specific aircraft type, the mission allocation function is departmentalized largely by aircraft type (TACC Overview Brief, 2000:38).

Once a mission has been planned and allocated, the execution, or command and control phase of the mission life cycle can begin. The core organizational issues addressed in this GRP are centered primarily around this phase. Through the mission execution function, the TACC exercises operational control over AMC-assigned aircraft and mission management authority over Air National Guard/Air Force Reserve and theater assigned assets on an AMC-assigned mission. The TACC area of responsibility (AOR) spans the entire globe and is subdivided into two cells. The East Cell AOR encompasses all of North America east of the Mississippi River, including all of

Minnesota and Louisiana and Canada east of 95 degrees west longitude, Europe, Africa and Asia to the India-Pakistani border, plus Bermuda and Ascension Island. The West Cell AOR begins west of the Mississippi River and includes all areas not included in the East AOR (AMCI 11-208, 2000:2-1). Figure 2-2 provides a graphical illustration of the East and West Cell AORs.

It's important to note that the East Cell encompasses key geographic areas that have seen the bulk of major U.S. military operations over the past decade. The Arabian Peninsula, Somalia, Bosnia-Herzegovina, and Kosovo, for example, all fall under the East Cell AOR. Aircraft location, rather than who "owns" the aircraft is the determining factor when deciding which cell has operational control. In case of missions scheduled to depart one AOR and terminate in another (Travis AFB, California to Mildenhall, England, for example), point of departure becomes the controlling factor, although a mid-mission handoff between different cells can be coordinated at the controller's discretion.

TACC Cell Areas of Responsibility



Figure 2-2 (Source: AMCI 10-202, Vol 2)

One exception to the geographic organization of the command and control function is the medical evacuation, or MEDEVAC mission. With one control cell for worldwide operations, the MEDEVAC mission control function is a product line based system. This is due at least in part to the limited scope of this specialized mission. Although the C-9 is the only aircraft in the Air Force Inventory designed specifically to perform the MEDEVAC function, the mission actually utilizes the C-9, plus many other aircraft in the AMC inventory for long range “strategic” MEDEVAC missions. While the MEDEVAC mission works quite well despite the lack of geographic areas of responsibility, its important to compare the small scope of the MEDEVAC mission relative to that handled by the rest of the TACC. On an average day, the TACC manages roughly 300 missions, while the MEDEVAC cell manages less than 10 (Libsch, 2000). Still, when evaluating different organizational structures for the flight dispatch operation, a close look at the MEDEVAC cell as a “mini test case” for a non-geographic based system may be warranted.

Into the Future: Global Air Traffic Management and Mobility 2000

In the 1970’s, the ICAO realized the aviation industry was growing too fast, and that revisions to the global air traffic management system would be necessary to maintain its viability into the next century. Today, air traffic control systems rely primarily on ground-based radar and navigational aids and pilot-to-controller verbal communications. The new airspace architecture, which the ICAO and FAA hope to have fully in place by 2010, will emphasize a new concept known as “Free Flight.” The Free Flight concept will give aircrews more freedom in selection of routes and altitudes, allow more direct

routings, and increase safety. At the same time, a given parcel of airspace under free flight will be designed to hold four times the number of aircraft as it does today. Successful implementation of the new architecture will depend on adoption of emerging communication, navigation, and surveillance technologies. Navigation will be accomplished with increasingly accurate Global Positioning System (GPS) and advanced flight management systems. Pilot-to-controller voice communications will be augmented and in many cases replaced by data transmissions, and safe separation of aircraft will be enhanced by surveillance systems that give pilots information on other traffic along with recommended actions (Rubalcaba, 1997:19, 20).

As Free Flight is phased in, aircraft not in compliance with new equipment requirements will be increasingly pushed out of the so-called “sweet airspace” which provides the fastest routings and most fuel efficient altitudes. General Walter Kross, AMC commander from 1996 to 1998, considered non-compliance an unacceptable option, touting it as the difference between restricted and unrestricted global mobility.

In 1996, under General Kross’ leadership, AMC instituted the Global Air Traffic Management (GATM) program to bring its aircraft and associated command and control systems in compliance with the new architecture. With implementation costs running into the billions of dollars, GATM will revolutionize communications, navigation, surveillance, and air traffic management capabilities.

Following the decision to implement GATM, the Command began to look for ways to leverage the huge investment in technology the program would entail. After analyzing their operation, the leadership of TACC realized that GATM provided a golden opportunity. With a relatively modest increase its investment, AMC would be able to

“ride” on the GATM requirements and provide real-time communications capability that could be the catalyst for effective collaboration between all parties involved in the mission management function. With this realization, the M2K concept was born, with Integrated Flight Management at its foundation.

Mission Management Versus Flight Dispatch

The current flight management system in AMC has extreme limitations that were summed up well in 1999 during a command presentation at the annual Airlift/Tanker Association convention:

Flight management in AMC can be characterized by isolation. Limitations in communications equipment, information systems, integration, and collaborative efforts have created ineffective single channel data flow. Aircrews are being task-saturated by routine communications with multiple agencies. The TACC is often reactive during execution because the data they need is often outdated by the time they receive it. When it comes to airborne mission changes, the aircrew is center of all the coordination because there is no link from C2 to ATC (Williams, 1999).

These shortcomings are inherent in the current duties of the mission manager, the person who serves as the primary conduit for information flow between the aircrew and the TACC. According to the FEDSIM study, today’s TACC mission managers spend 60 to 80 percent of their time chasing takeoff and landing times (FEDSIM, 1999:5-17). Major Vince Raska, TACC Regional Operations Director, corroborates the current “data entry” nature of the mission manager position. Raska explains that most of the mission managers are extremely dedicated and talented, but have built a core of expertise that revolves mostly around systems familiarity. Many managers, for example, are experts at operating and updating the Global Decision Support System (GDSS), which contains the

master data base AMC uses to direct, execute, and control its flying mission. They do not, however, have the training, experience, or support structure to anticipate an imminent mission problem, develop a collaborative solution, and relay their recommendations to the aircrew on a real-time basis. When asked what occupies most of a mission manager's time, Raska replies: "making phone calls and hunting down information" (Raska, 2000).

Under the IFM concept, a FAA-certified dispatcher or flight manager will replace or augment the current mission manager position. In the global air traffic environment, the dispatch function has evolved to download aircrew workload, and provide a safer and more efficient flight operation. A civilian dispatcher job description appears in Table 2-1.

Job Description of the Civilian Aircraft Dispatcher/Flight Manager

Pre-Flight	Enroute	Post Flight
Analyze and evaluate meteorological information to determine potential hazards to safety of flight and to select the most desirable and economic route of flight.	Update the aircraft commander to significant changes in weather or flight plan and recommend alternatives, such as changing course, altitude and, if required, in the interest of safety and economy, landing enroute.	Evaluate the quality of meteorological data.
Compute fuel requirements for the safe completion of flight according to type of aircraft, distance of flight, maintenance limitations, weather conditions and minimum fuel requirements prescribed by military aviation regulations.	Monitor weather conditions, aircraft position reports, fuel status, and aeronautical navigation charts to evaluate the progress of flight.	Evaluate accuracy of flight plan based on actual arrival times and fuels
Ensure diplomatic clearances are secured and that the flight plan route complies with the diplomatic clearance requirements.	Ensure diplomatic clearance window remains valid and monitor for change or withdrawal of diplomatic Clearance.	Provide feedback
Prepare flight plans that honor all maximum allowable structural and performance limiting weights.	Review destination and alternate airports for changes in conditions that could adversely affect maximum landing weights and quick turn times.	Feedback
Review airport Maximum on Ground (MOG) considerations to ensure the aircraft's estimated time of arrival and stay on the ground will not exceed airport capabilities or limitations.	Monitor airport Maximum on Ground considerations to ensure the aircraft's revised estimated time of arrival and stay on the ground will not exceed airport capabilities or limitations.	Feedback
Prepare flight plans that will not violate airport and country hazardous materials restrictions.	Ensure that any re-route or diversion will not violate airport and country hazardous materials restrictions.	Feedback
Review weather reports, field conditions, braking action reports, Notices to Airmen (NOTAMS), and other informational components required for the safe completion of flight.	Warn the aircraft commander of unforeseen meteorological developments, unexpected losses of navigational aids or sudden changes in traffic and field conditions which might adversely affect the successful completion of the trip.	Feedback
Prepare and sign the flight release which states that all aspects of the flight plan preparation have been reviewed and the mission can be conducted in a safe and efficient manner.	Offer, solicited or unsolicited, an alternative plan of action to the aircraft commander when the original plan cannot be followed.	Feedback

Table 2-1 (Source: FEDSIM PEP 18 TACC Project)

The civil aircraft dispatcher is a licensed airman certified by the FAA, and shares joint responsibility with the aircraft captain for the safety and operational control of flights under his or her guidance. The dispatch function serves as the basis for command and control in the airline industry. Compared to the current mission managers, TACC flight dispatchers will take a much more active role in making decisions and performing tasks that directly impact mission success. Additionally, the dispatcher will also be expected to anticipate potential problems that could affect the mission, utilize the tools at his or her disposal to develop solutions, and work with the aircrew to implement these solutions.

A brief mental comparison of a few of the job elements listed in Table 2-1 helps illustrate the differences between the role of today's TACC mission manager and the flight dispatcher that will be part of the IFM initiative. The dispatcher analyzes and evaluates meteorological information. Missions managers do not play an active role in the analysis of meteorological data, but will help coordinate weather-related mission changes at the aircrew's request. Dispatchers are responsible for computing specific fuel requirements and preparing flight plans that take advantages of favorable weather conditions, and comply with aircraft performance parameters, mission requirements, and diplomatic clearances. TACC mission managers do not prepare flight plans. Instead, flight plans are prepared by the planning cell and the mission manager transmits them to the aircrew along with the following disclaimer: "The accuracy of this computer flight plan depends on the accuracy of the navigation data base, the weather data base and user input. Aircrews are responsible for fuel requirements and the route of flight they file and fly." Dispatchers review numerous informational components required for the safe completion of the flight, such as Notices to Airmen, field conditions and braking action

reports, and coordinate with the aircrew if any condition is listed that might affect flight safety. Mission managers do not routinely review such documents. Finally, before a mission can commence, the dispatcher must sign a dispatch release stating that all aspects of the flight plan preparation have been reviewed and that the flight can be conducted in a safe and efficient manner. The mission manager has no responsibility for signing a release.

The ability of the flight dispatcher to effectively perform all the functions mentioned above will depend on the availability of reliable real time or near real time communications capability. Fortunately for AMC, compliance with GATM will be the great enabler that provides the TACC with this capability. With GATM-compliant infrastructure and the introduction of a robust flight dispatcher function, TACC may well realize its goal of providing aircrews operating in the worldwide AMC system with a highly capable “virtual crewmember” that is a true partner in ensuring mission success.

III Organizational Alternatives

Theoretical Background:

The second step in the rational decision making process is the identification of alternatives. Once the decision situation has been recognized and defined, the second step is to identify alternative courses of effective action. In general, the more important the decision, the more attention is paid to developing alternatives. The development of both obvious, standard alternatives, and creative, innovative alternatives is generally useful, although managers must recognize that various constraints can limit their alternatives (Griffin, 1999:271). This chapter develops alternatives for organization of the TACC flight dispatch operation, setting the current TACC mission management operation and the typical commercial airline dispatch center as basic benchmarks. The chapter uses the initial FEDSIM organizational proposal as one alternative. To develop other alternatives, the original proposal is altered to produce designs that reflect the organizational options (product line or aircraft type orientation) mentioned by General Becker. Next, it discusses the competencies that will be most greatly enhanced by each organizational option. For illustrative purposes, this chapter relies heavily on the use of facilities layout diagrams. Griffin states: “the choice of physical configuration, or the layout, of facilities is closely related to other operational decisions” (Griffin, 1999:656). This researcher considers organizational structure one of the “other operational decisions” to which Griffin is referring.

The Benchmarks

The Integrated Flight Management proposals made by the FEDSIM study appear to be evolutionary rather than revolutionary. In discussing project constraints, the final FEDSIM report states: “Existing AMC applications...represent substantial man-years of investment in development and training, have numerous automated interfaces, and thus cannot be replaced or changed in significant measure in the near future. Therefore a concentration on enhancement, rather than replacement, forms a project constraint” (FEDSIM, 1999:3-1). At the same time, the report states that its recommendations are based upon “best practices relative to strategy, technology, organizational and international aviation consulting” and “experiences and information derived from major international airlines” (FEDSIM, 1999:4-1). This GRP then, assumes that the most successful organizational design for the flight dispatch function will retain essential elements of the current TACC operation and enhance them through the appropriate adaptation of certain practices utilized in the commercial transportation industry.

TACC Structure. The general organizational structure of the today’s TACC command and control function—geographic basis with East and West Cells—has been discussed in Chapter 2. Figure 3-1 shows the current TACC command and control center floor plan. It is provided primarily so comparisons can be made to organizational structures discussed later in this chapter, but also provides a good illustration of the division that currently exists between the East and West Cells. In a practical sense, these cells are divided physically (via 4-foot partitions) as well from a personnel and functional standpoint. Except for the senior controller, personnel assigned to the command and control center are normally permanently assigned to a specific cell. Although a limited

degree of personnel cross-flow between cells takes place during surge operations, this is the exception rather than the rule. In fact, the disproportionate workload placed on the East Cell during Operation Allied Force became a good-natured bone of contention between east and west mission managers. In the same way, a “functional wall” exists

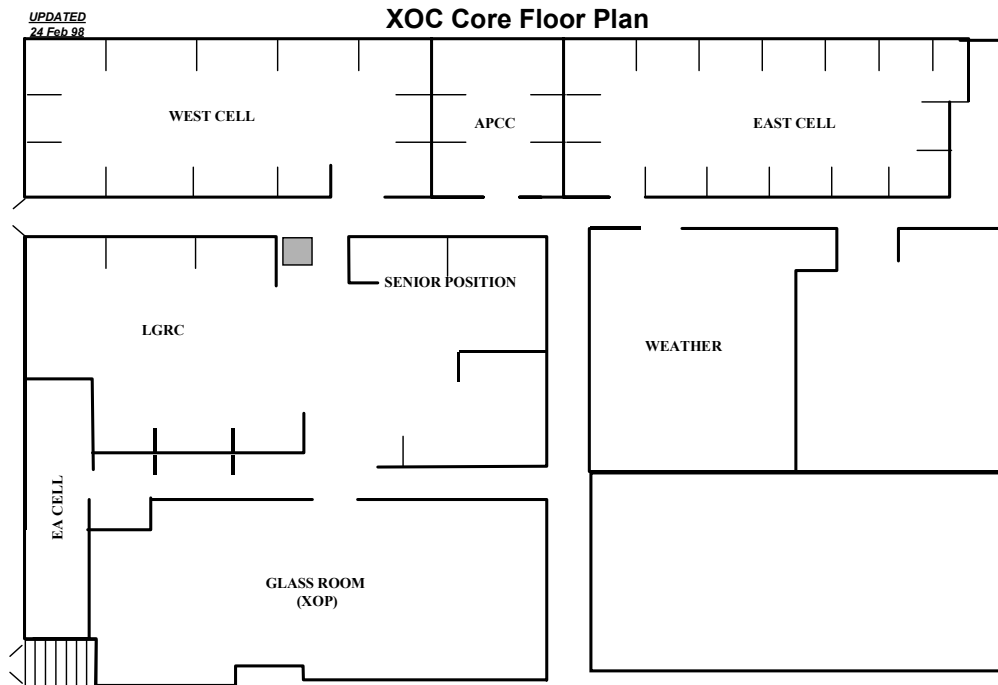


Figure 3.1 (Source: TACC/XOC)

between the cells. With a few exceptions, west cell facilities and equipment are used to control west cell “owned” aircraft, and East Cell resources control east “owned” aircraft (Raska, 2000).

It’s important to note that within each cell are functional desks that control a specific type of mission, or product line. Within the East Cell, for example, are desks dedicated to channel missions and Special Assignment Airlift Missions (SAAMs). Accordingly, the primary controller for a particular AMC mission will be assigned to a

position having both a geographic and a product-line orientation, such as “eastern channels” or “western SAAMs.” The presence of product line subdivisions within the existing control cells implies a tacit acknowledgement that a pure “geography only” structure might not be fully effective.

The Airline Operations Center. The commercial airline equivalent of the TACC command and control facility is commonly referred to as the Airline Operations Center (AOC). AOC facilities and staff vary with size of the airline, with the smallest airlines having just one dispatcher on duty and the largest carriers having 25 or more. The AOC for a large airline [which compares in scope to AMC] generally has a dedicated air traffic control coordinator, dispatchers, and critical support functions such as crew scheduling, aircraft scheduling, and meteorology. Additionally, it contains a crisis center [similar in function to the TACC crisis action cell] that is used to manage irregular operations, incidents, and accidents. Supplementary functions such as navigation data base maintenance, operations engineering, and flight technical services are usually located nearby and are available for use by dispatchers and aircrews (USDOT/FAA, 1997:14). Figure 3-2 illustrates the Airline Operations Center at United Airlines, which is similar to the AOC of many large carriers. A comparison to Figure 3-1 shows many similarities between the basic layout of the TACC command and control facility and the United Airlines AOC. At United, flight dispatchers work in single area arranged in quadrants; at TACC, mission managers work in the East and West Cells. The United AOC contains works areas that house scheduling, meteorology, and the crisis center. In the TACC, the meteorology function is handled in the “weather” area, and the “Glass

Room” serves as the crisis action center. The planning and scheduling functions are not located in the core command and control area, but take place in a room located nearby.

Airline Operations Center at United Airlines

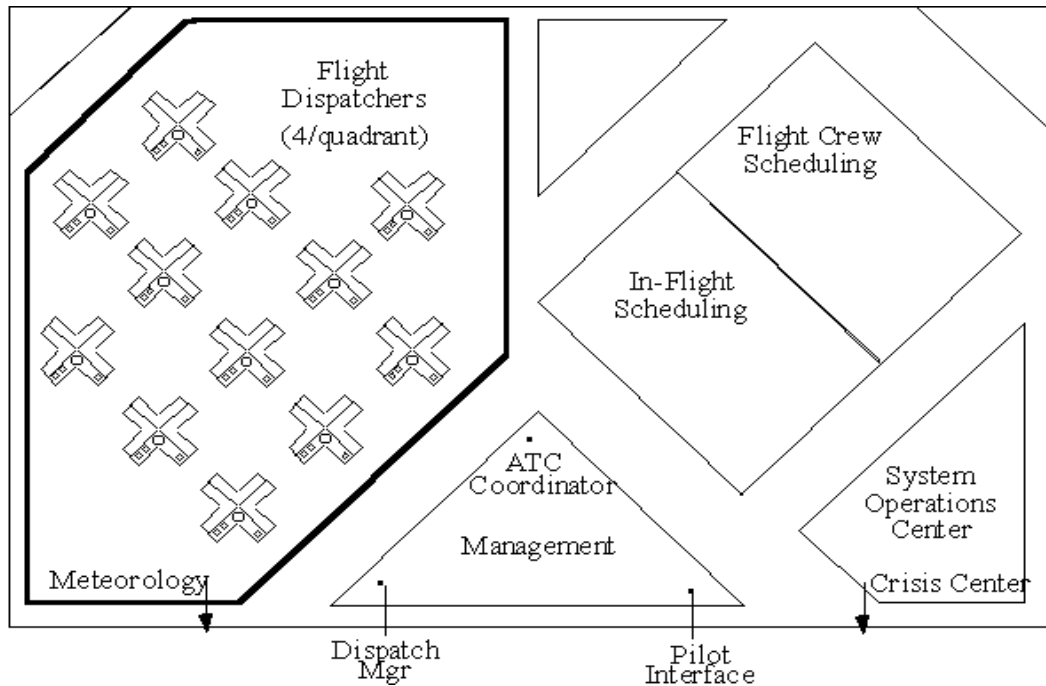


Figure 3-2 (Source: USDOT/FAA, 1997:14)

From a functional standpoint, perhaps the most glaring difference between a major airline AOC and the TACC comes in the area of accessibility of information. As mentioned earlier, the TACC mission manager spends a majority of his or her time chasing information, either via phone calls or by walking around the TACC. The mission manager workstation consists of a phone and a computer keyboard and monitor through which he or she can access GDSS and the standard Microsoft Office applications. Mission manager e-mail programs are specifically adapted to provide L-Band Satellite Communications capability. The dispatcher at a major airline, by contrast, works at a console similar to that illustrated in Figure 3-3. This workstation fully integrates all

major functions of the AOC and puts them at the dispatcher's fingertips. The dispatcher has immediate access to communications with aircraft in the system, air traffic control, and any other resource via radio, telephone or data link. Additionally, the console provides access to maintenance data, multiple weather displays, and resource tracking

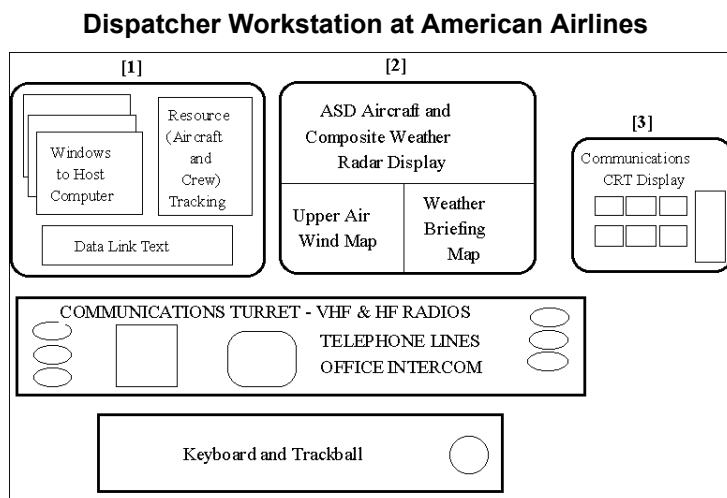


Figure 3.3 (Source: USDOT/FAA, 1997:25)

affect flights in progress (USDOT/FAA, 1997:25-30).

Most major airlines divide the workload in their AOCs in a geographic fashion. The flight dispatch group is generally arranged into domestic and international operations, and then further subdivided into geographic regions (Grandeau, 1998:323). At the United Airlines dispatch operations center shown in Figure 3-2, all dispatchers work in the same general area, but groups of consoles will collectively control domestic and international operations, with individual dispatchers having responsibility for flights in a specific region.

David Porter, Manager of Operations Services for Delta Airlines, points out that while geography forms the organizational basis in most AOCs, carriers tailor their operations to meet individual needs. The Delta system, for example, has international

functions. A “big picture” display illustrates aircraft movement on a real time or near-real time basis, and includes a function to provide a graphical overlay of current weather information that might

and domestic dispatch operations with geographic subdivisions within each. Within the same AOC, the airline maintains a separate operation to dispatch its Northeast Shuttle service. The Northeast Shuttle consists of a small group of regularly scheduled flights operating along specific high-density routes in the Northeastern United States. Because the Delta Northeast Shuttle offers only single-class passenger service, it requires dedicated aircraft with the appropriate seat configuration. In a way, the shuttle operates as an airline within an airline (Porter, 2000). Consequently, separating the dispatch function from the rest of the AOC was a logical step, and introduced a small-scale product line based dispatch operation within a larger geography based system.

Large cargo-only airlines pattern their dispatch operations after those used by the major passenger carriers. At Federal Express, the Global Operations Control Center is broken down domestically and internationally, and then further subdivided into smaller regions. A dispatcher and a freight coordinator work together to manage traffic and cargo flow through each region's system (Duquette, 2000).

The organization of the TACC command and control operation and a major airline AOC appear to be similar in many ways. One major difference, however, is glaring.

Without a doubt, the connectivity of command and control systems at major commercial airlines is far more advanced than that in place at the TACC. Fortunately, by the time the TACC flight dispatch operation is implemented, AMC intends to have in place systems that provide connective capability that is on par with that of the commercial airlines. This will include the introduction of flight dispatcher consoles that are similar in form and function to the one illustrated in Figure 3-3.

Another major difference between an AOC and the TACC is the degree of overlap between the planning, scheduling and execution functions. In the case of an AOC, the dispatcher gathers data pertinent to mission requirements, creates the appropriate flight plan, approves it, and transmits it to the crew. In the TACC, mission data is gathered and the flight plan is prepared (and often transmitted) by a separate planning cell. In short, the commercial dispatcher plays a much larger role in the planning and scheduling function than is the case in the TACC. As we move further into the future, we should keep in mind that the capabilities of the TACC and the commercial sector—in terms of both personnel and equipment—will likely become more closely aligned. Consequently, the existing TACC command and control structure and the typical Airline Operations Center should remain valid benchmarks upon which the future dispatch operation can be built.

Organizational Options for the TACC Flight Dispatch Operation

Option 1: Geographic Orientation. This option adopts the recommendations presented in the FEDSIM final report. The FEDSIM proposal builds a geography based organizational structure centered around the command and control group as it now exists. The east/west cell structure is replaced by a group of 12 dispatchers distributed in three cells (East, West, and Americas). An alternative structure which would consist of only two cells (East and West) has also been discussed (Hanbey, 2000), but this project uses the three cell configuration for comparison purposes. The new organization is built within the current TACC through modification of the existing facility. Figure 3-4 illustrates the functional layout of the IFM facility as presented in the FEDSIM study.

The geographic regions provide for a division of responsibility within the facility that closely mirrors commercial AOCs and the current TACC operation. Additionally, they

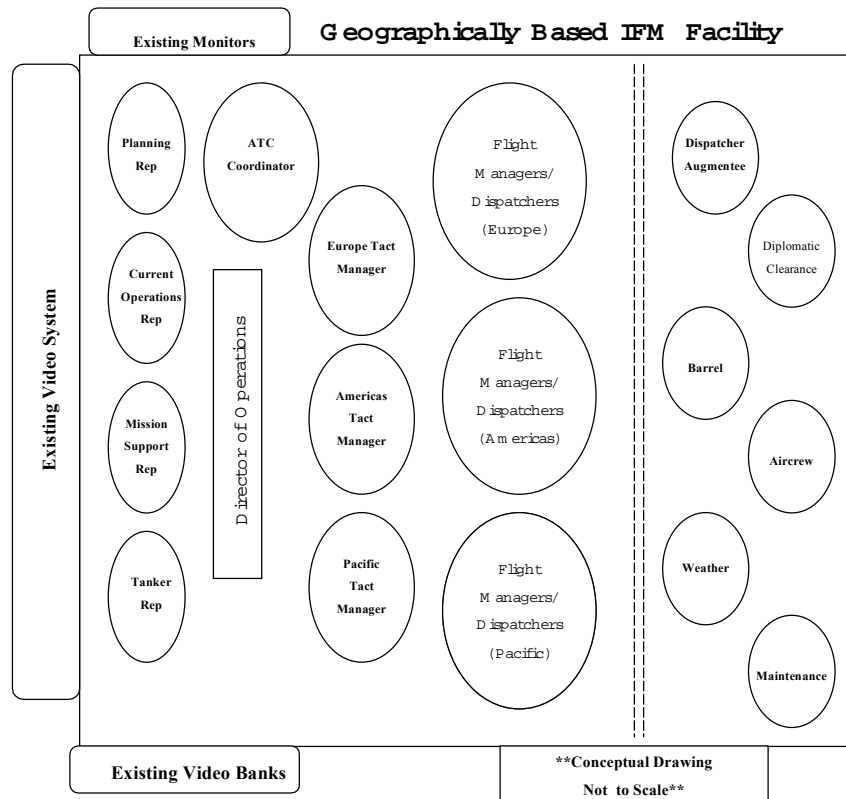


Figure 3-4 (Source: FEDSIM PEP 18 TACC Project, 1999:7-12)

would allow for easy linkage with the Pacific and European Air Mobility Operations Control Centers, which coordinate in-theater air mobility operations. Dispatchers are assigned to manage specific flights within a given region (FEDSIM, 1999:7-4). Although not mentioned in the FEDSIM proposal, the geographic cells could be subdivided by aircraft type or product line. One dispatcher, for instance, might manage eastern channels, just as is done in the TACC now.

Diplomatic clearance, weather and maintenance departments are co-located with the dispatchers and are on duty round-the-clock. They work as a team with the

dispatchers to ensure sound support is provided to aircrews as missions are exposed to unexpected constraints and operational considerations. Additional support functions, such as planning, scheduling, ATC coordination, and mission support are also located in the facility, and are available to the dispatcher.

Tactical managers, whose duties are also distributed by geographic sector, provide management oversight of the dispatch function. They continuously interface with one another to ensure a seamless transition when control passes from one cell to another. The Tactical Manager is tasked with ensuring that all missions within in his or her respective sector are executed properly on a system wide perspective. Working as a team, the three tactical managers control their sector as a subsystem within the global perspective and then task individual missions under their control to individual dispatchers. The Director of Operations has overall responsibility for the dispatch operation and all supporting functions. He or she provides strategic oversight of the operation and ensures that the entire team operates in an effective and proactive mode to ensure the safety and success of global AMC operations (FEDSIM, 1999:7-5).

Option 2: Product Line Orientation. This organizational option, illustrated in Figure 3-5, takes the FEDSIM proposal presented in option 1 and modifies it in order to group dispatchers and tactical managers by product line rather than geography. Changes from Figure 3-4 are shown with a gray background. Instead of Cells representing the Americas, East and West regions, they now represent the primary categories of AMC missions. Because under the current system command and control of Special Assignment Airlift Missions (SAAMs) tends to be the most labor intensive (Raska, 2000), the product line system structure dedicates one cell solely to handling this function. The other two

cells are dedicated to handling two product lines each. This initial proposal couples channels with air refueling missions and contingencies with exercises. These “work groups” could be realigned periodically until an optimal mix is found. The support

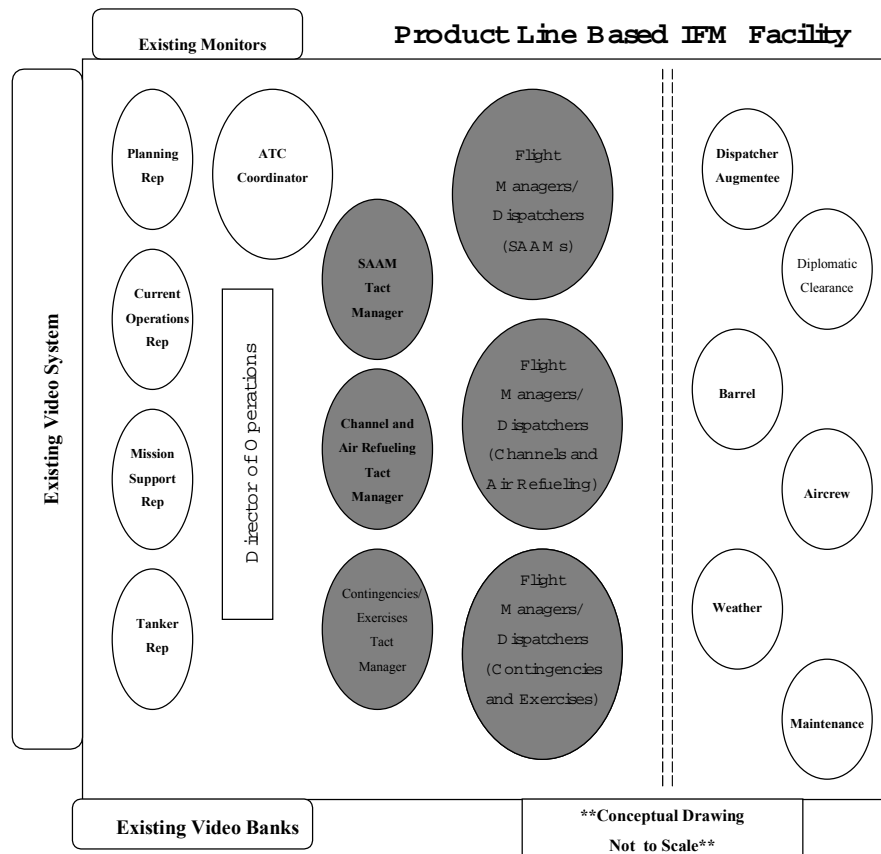


Figure 3.5 (Source: Modified from FEDSIM, 1999:7-12)

functions under the product line option remain largely unchanged from the way they operate in the geography based system. If desired, east and west “area reps” could be added as an additional support function to offset any shortfall in regional expertise resulting from the loss of geographic cells. Dispatcher work groups are tasked with managing all missions within a particular cell, regardless of geographic region or aircraft type. In the same way that the geographically oriented cells in option 1 could be

subdivided by product line, the product line oriented cells in option 2 could be subdivided by region. Subdividing by aircraft type could prove more problematic, because of manning constraints. Having an eastern “SAAMs” and “western SAAMs” dedicated dispatcher for instance, would be easier to arrange than having dispatchers assigned to “C-130 SAAMs,” “C-141 SAAMs,” “C-17 SAAMs,” and so on. Like in option 1, the tactical managers would be charged with controlling the execution of missions from a system perspective. They would also ensure continuity between cells, although under the product line oriented system missions would generally not transition from one cell to another. A mission of a particular product line would remain under the control of a single cell throughout its lifecycle. In the product line oriented system, the Operations Director provides strategic oversight of the operation and ensures that the entire team operates in an effective and proactive mode to ensure the safety and success of global AMC operations. This is the same role the operations director plays in the geography based system.

Option 3: MDS Orientation. A proposed layout for an MDS (aircraft type) oriented organizational structure is shown in Figure 3-5. The MDS orientation contains three cells, with two aircraft types paired under each cell. Although it would be possible to have six cells dedicated to one type of aircraft each, the pairings configuration is suggested for two reasons. First, maintaining communications and continuity between six cells could prove very difficult for the Operations Director and Tactical managers. Secondly, the aircraft pairings are made with basic mission design and interchangeability in mind. The KC-135/KC-10 pairing is made based on air refueling capability, and in the majority of cases a KC-10 can mission back fill for a KC-135 that unexpectedly goes

down for maintenance. The C-5 and C-17 pairing is based on outsize cargo capability. The C-130 and C-141 are paired because of their standard (single pallet width) cargo

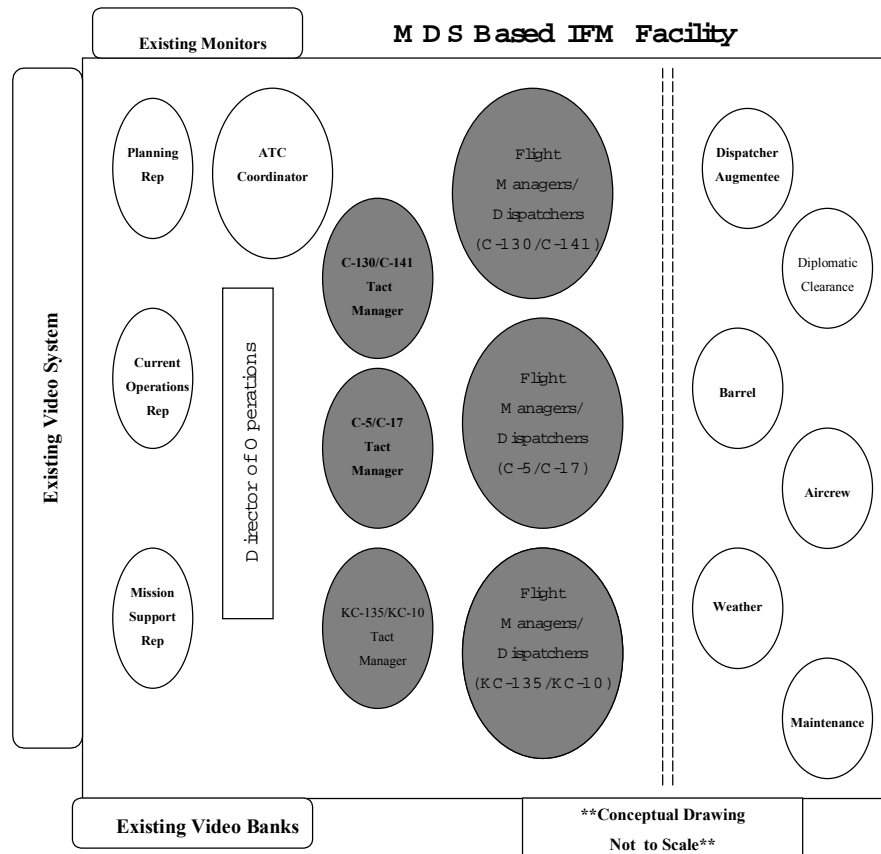


Figure 3.6 (Source: Modified from FEDSIM, 1999:7-12)

capability and their extensive use in airdrop operations. Tactical managers under the MDS oriented system would ensure continuity between cells, and would need to be especially cognizant of how each product line was being executed on a system wide perspective. At any given time, for example, several global channel missions could be operating simultaneously with aircraft being dispatched by three different cells. Ensuring smooth execution of the channel function in this case could prove a real challenge for the tactical managers and the operations director.

Options and Competencies. If implemented, each of the organizational options discussed above will by its very nature create a system that supports certain competencies over others. These competencies are built over time as the learning curve is overcome and dispatchers gain increased expertise. The differences in organizational structure presented in the paragraphs above revolve primarily around the distribution of work to the individual command and control cells. Consequently, the competencies that a particular structure produces will likely be reflective of the concentration of work within the cells.

The propensity of the TACC dispatch system to build competency through experience will be especially apparent in light of AMC's recent decision to man the dispatch operation largely through the hiring of civilian government service employees. The choice to use federal civilian employees was made largely for the purpose of continuity (Hanbey, 2000). A predominantly military representation in the dispatcher workforce would bring with it a constant turnover of personnel, with most personnel staying only 2 or 3 years after becoming mission certified. A civilian-dominated dispatch operation will mean a more stable work force, more long-term employees, and a more rapidly growing experience base.

The geographic based structure suggested in Option 1 would tend to build system-wide regional expertise. Because each cell is dedicated to controlling a specific area of the world, over time, the dispatcher teams would become intimately familiar with such regional issues as unique weather patterns, topographical information, diplomatic clearance requirements, air traffic control constraints, and data on specific airfields. This regional emphasis could hinder the development of in-depth aircraft-specific expertise

and an intuitive working knowledge of how specific missions are built and executed.

From an external perspective, an outsider coming into the TACC wanting to tap a pool of experts for handling a regional issue would immediately know which cell to turn to. This would not be so if the issue involved a mission or aircraft specific problem.

The product line based structure would build a core of mission area experts. Dispatchers in the channels and air refueling cell, for example, would know all the idiosyncrasies of the global channel system. They would be familiar with variable ground times based on mission type, what aircraft type was authorized and capable of handling a specific mission, and how to prioritize cargo loads. As air refueling experts, they would understand offload capabilities, be able to match aircraft type with receiver type, and make an intuitive decision on how to meet short-notice air refueling requirements. Based on the fact that aircraft are built with specific missions in mind, the product line based structure would tend to build a certain degree of aircraft-specific knowledge, such as cargo capacity or outsize cargo capability. Mission area expertise would most likely come at the expense of regional knowledge. With responsibility for worldwide channel missions for instance, it might be quite some time before the channels/air refueling cell became a core of functional expertise on the Western Pacific theater

The MDS orientated structure would create a pool of aircraft experts. Through this structure would come the capability to successfully trouble shoot a myriad of aircraft related problems and malfunctions. Of the three options discussed, the MDS oriented structure would be most capable of providing aircrews in the system with assistance in solving an aircraft systems problem posing a threat to safety or mission accomplishment.

Moreover, if informed of an aircraft systems problem enroute, the dispatcher would have a good mental idea of what maintenance would be needed at the enroute location, and could pre-coordinate the necessary support. In addition, the MDS oriented dispatcher would become an authority on the capabilities, strengths and weaknesses of individual aircraft.

Chapter Conclusion.

This chapter has presented a framework upon which further discussion of organizational options can be based. This framework begins with a comparison of the today's TACC command and control system and more capable commercial systems. Next, it presents options for designing the TACC dispatch operation, based on geography, product line, or aircraft type. Finally, it discusses broad competencies that each organizational option would produce in and of itself. The next two chapters consider the advantages and disadvantages of the various organizational alternatives within the environment they will operate.

IV Evaluating the Alternatives

Theoretical Background

The third step in the rational decision-making process is evaluating each of the alternatives. Griffin suggests that each alternative be evaluated in terms of feasibility, satisfactoriness, and its consequences as illustrated in Figure 4-1. An alternative is considered feasible if it falls within the realm of probability and practicality. Reasons for

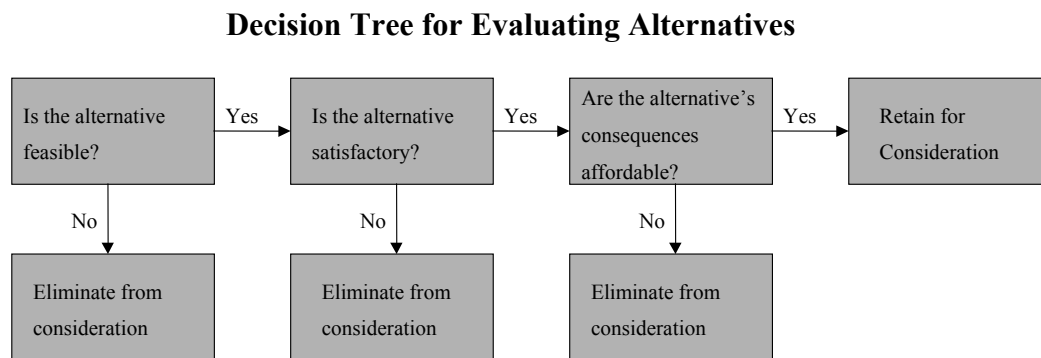


Figure 4.1 (Source: Griffin, 1999:272)

unfeasibility might include unattainable technological requirements, unacceptable cost or prohibitive legal barriers. Once the feasibility test has been passed, the alternative must be evaluated to consider how well it satisfies the conditions of the decision situation, i.e. how well it will meet the goals that management has set. Finally, when an alternative has proven itself both feasible and satisfactory, its probable consequences must still be assessed. In other words, to what extent will a particular alternative influence other parts of the organization and what will be the costs? If the consequences are too expensive for the total system, the alternative must be rejected (Griffin, 1999:272).

Before an operational structure is selected for the flight dispatch operation, the alternatives presented in Chapter 3 should be evaluated using Griffin's decision tree. In order to allow in-depth analysis of each alternative, this GRP initially assumes that all alternatives pass the feasibility test. Based on the information currently available, there appear to be no barriers so strong that they make an alternative immediately unfeasible. In other words, all alternatives will at least be considered. The evaluation of alternatives, then, will focus on steps 2 and 3 in Griffin's decision tree.

In his discussion of the decision making process, Glen Whyte emphasizes the important role that the use of decision frames can play. The term "decision frame" refers to a point of reference from which a decision is made (Whyte, 1991:24). As an example, an investor might be evaluating whether or not to sell a block of stock that has risen in value and ask himself the following questions: Do I need quick cash? Will the market continue to rise or is it poised to fall? Am I prepared to pay the applicable capital gains tax? Each of these questions could represent a decision frame. The investor's ultimate action will depend on which frame he makes his decision from, and he will perceive the outcome of his decision relative to this frame as either a gain or a loss. Whyte further contends that the improper framing of decisions, or "framing effects," have been responsible for many major decision failures. He suggests several methods to mitigate framing effects. One of these methods is the employment of multiple frames: "decision makers should be encouraged to frame decisions in many ways using multiple points of reference...stability of preferences across different frames suggests that it is the outcomes of the decision that are dictating choice, rather than the frame adopted" (Whyte, 1991:27,28).

In the context of Griffin's decision tree, this chapter evaluates alternative organizational structures for the TACC flight dispatch function. Adaptation of Whyte's "multiple decision frames" is the selected method of evaluation. The selected decision frames are drawn from three major goals of the flight dispatch initiative.

Evaluation of Alternatives

Program Goals Approach: Goal Selection. To simplify the evaluation of alternatives, this section selects and discusses three major goals that have been linked to the TACC flight dispatch function. These are highlighted as "major" goals because they are broad in scope, have been repeatedly mentioned, and come from multiple sources. They all have been either mentioned by senior leaders within the TACC through personal interviews or have been presented in command briefings to personnel serving at the general officer level or higher. All the goals discussed are also mentioned in the FEDSIM report. While this definition of a major goal is admittedly arbitrary, in the researcher's judgement, the goals identified are sufficiently far-reaching to be considered "decision frames." That is, a point of reference or criteria from which a decision on the choice of organizational structure can be made. Considered in isolation, of course, each goal may portend a different organizational structure. Through the evaluation of all relevant goals, it may be possible to "frame [the organizational] decisions in many ways using multiple points of reference" (Whyte, 1991:27,28).

The goals under consideration are 1) Safety, 2) Efficiency and effectiveness, and 3) The virtual crewmember. The evaluations are presented in the following paragraphs.

Program Goal Approach: Goal Evaluation. The evaluations below are presented in narrative form, and follow a similar format. First the goal is identified and attributed. Secondly, the goal is taken in isolation and subjectively evaluated relative to each organizational alternative and its associated competencies as discussed in the previous chapter. Finally the researcher makes a recommendation based on the evaluation. The recommendation indicates if one organizational alternative for the TACC flight dispatch best supports the goal under consideration, or if it appears there will be no correlation (i.e. the goal is system neutral).

Goal 1: Safety. If there is one theme inherent in the flight dispatch developmental process, it is the requirement to maintain safety—it is the absolute number one priority. Leaders at every level of the command in the TACC share this view. If it is determined that any organizational option will adversely affect safety, it should be rejected outright. This researcher considers the *maintenance of safety* such a serious issue that it actually falls under the “feasibility test” in Griffin’s decision tree—a clear safety compromise is grounds for unfeasibility. Thus, the mere fact that safety is being evaluated in this section infers that none of the organizational options under consideration will lead to such a compromise. In the same way, it is assumed that if a safety compromise is found in the future, the appropriate alternative will be rejected.

This being said, it is possible that one or more alternatives under consideration, in addition to maintaining safety, could actually *enhance* safety. In its discussion of “TACC processes, opportunities and benefits” the FEDSIM report presents numerous current TACC processes that will be improved under IFM, along with expected benefits. Under three of these categories (creation of flight plans, creation of weather briefings, and

provision of maintenance oversight), the study lists enhanced safety as an expected benefit, although it does not define this benefit (FEDSIM, 1999:5-9 – 5-11). For evaluation purposes, this project defines two possible safety benefits that could be tied to an improved flight planning process. First, the expected benefit could come from enhanced knowledge at the dispatch level of geographic areas and related safety issues, to include preferred routings, the location of mountainous areas, restricted and warning areas, location of refueling tracks, and countries over which overflight is prohibited. A dispatcher with this innate knowledge would be most likely to produce a plan that avoids dangerous areas, give flight plans a final “sanity check” before transmitting them to the crew, and possibly avert a geography-related incident or accident. This geography-related expertise, of course, would be most likely to exist under the geography-based dispatch system. The second flight planning-related safety benefit could come in the area of aircraft knowledge in the dispatch cells. A dispatcher intimately familiar with a particular aircraft would be least likely to produce a flight plan that contained safety-related errors such as a fuel load that was too heavy or too light, an incorrect offload, unrealistic airspeeds, or flight into areas not compatible with on-board communications or navigation equipment. This aircraft expertise would be most prevalent in an MDS-based dispatch system.

The creation of weather briefings is another improvement area under which FEDSIM expects to see a safety benefit. The added safety benefit under the flight dispatch system would likely come with the delivery, both before and during flight, of up-to-date, accurate, and properly analyzed weather data to the aircrew. The availability of more accurate and timely data would allow the aircrew to plan ahead to avoid

hazardous weather. Under the dispatch system, weather reports will be created by a meteorology cell and provided to the dispatcher through the multi-function work station. The dispatcher, however, will be responsible for transmitting weather data to the crew at the right time. Because it's required by regulation, the quality of the pre-flight weather briefing would probably not be affected by choice of dispatch system. The identification and tracking of mid-mission hazardous weather developments, and timely transmittal of applicable information to the aircrew, however, could most easily occur with a dispatcher focused on missions in a single region. Thus, weather-related safety issues would portend a geography-based system.

The final potential safety benefit identified is maintenance oversight. Although the FEDSIM does not specifically define this benefit, it's logical to assume a dispatch cell possessing in-depth knowledge of a specific aircraft (i.e. the MDS based alternative) would best support any maintenance-related safety benefit.

Again, it's important to emphasize that the goal of *maintaining* safety will be equally supported by any organizational alternative. In terms of potential safety enhancements, however, the safety decision frame points to selection of either an MDS or geography-based dispatch system.

Goal 2: Efficiency and effectiveness. Senior leaders within the TACC have mentioned efficiency and effectiveness as major goals of the flight dispatch system. Brigadier General Michael Wooley, TACC Commander, emphasizes the importance of maximizing efficiency. An efficient [dispatch] system, he says, is “akin to putting more aircraft in the air,” which leads to greater combat capability (Wooley, 2000). Colonel Greg Padula, TACC Director of Operations Management, considers effectiveness to be a

primary goal (Padula, 2000). Colonel James Rummer, TACC Director of Command and Control, stresses the importance of finding a balance between efficiency and effectiveness (Rummer, 2000). This study purposely combines efficiency and effectiveness into one macro goal.

All too often, decision-makers tend to think of efficiency and effectiveness as diametrically opposed concepts, i.e. in order to have one you sacrifice the other. The recent employment of air refueling tankers to support Operation Allied Force provides a good illustration of this paradigm. Viewed from an effectiveness standpoint, the employment of tankers was a great success—by and large, combat aircraft received the fuel they needed to complete their missions at the proper time, at the right place and in the required amount. Ultimately, of course, the operation was a success. This capability, however, was achieved in large measure by pumping excess capacity into the system. In terms of numbers of aircraft and pounds of fuel, there was far more air refueling capacity in theater that was actually used (Payne, 2000). So while AMC air refueling capability was inefficient but effective from the Balkan frame of reference, it might have been seen as inefficient *and ineffective* from a national security perspective had Iraq re-invaded Kuwait or North Korea invaded the south during the months of Operation Allied Force.

As the TACC flight dispatch function is built, decision-makers should strive to think of efficiency and effectiveness as inexorably linked. That is, build a system in which efficiency supports effectiveness. An effectiveness goal for M2K has been described in terms of maximizing system throughput or velocity. In other words, moving a large number of aircraft through the system, while reducing closure times and maintaining real time command and control of assets. A system with sufficient velocity

will enhance combat effectiveness by delivering more assets faster to any location on the globe. With effectiveness taken by itself, it's difficult to evaluate whether one particular organizational structure will support increased throughput per se. After all, the technological enablers and resultant command and control capacity will be in place regardless of which dispatcher sits in which cell. It is useful then, to ask if there is a particular structure that will yield the greatest efficiency. If this is the case, perhaps it could also be the enabler for greater effectiveness.

The Griffin definition of efficiency is “using resources wisely and in a cost-effective way.” Griffin further states that resources can be categorized as human, financial, physical or information (Griffin, 1999:8). This evaluation of potential efficiencies within the TACC flight function focuses on human resources (in the form of dispatchers) and physical resources (in the form of dispatcher workstations). It assumes that the number of dispatchers on duty and the number of workstations available is set at twelve (based on the numbers proposed by FEDSIM), and cannot change with choice of organizational structure.

One method of increasing efficiency within the IFM facility might come with maximizing flexibility. In TACC parlance, we'll define flexibility as “the ability to rapidly and effectively adapt to changing requirements, during both steady state and surge operations.” The core resources in the IFM facility will be approximately twelve dispatchers with equal training, but varying competencies and job assignments, and approximately twelve workstations with essentially equal capabilities. As a result, the manner in which the dispatchers are utilized will have the greatest potential affect on system flexibility.

There are some indications that there may be a certain lack of flexibility in the TACC command and control system. As briefly discussed in Chapter 2, Major Vince Raska, TACC Regional Operations Director, mentions the more or less permanent assignment of personnel to one of the two TACC cells. Also, there are the off-handed remarks made by East Cell mission managers regarding the disproportionate distribution of workload between cells during Operation Allied Force. Another possible indicator of inflexibility: aircrews in the system frequently hearing “I don’t have time to deal with that” from controllers (FEDSIM, 1999:5-4). Taken together, these three observations could be indicators that during surge periods some controllers become rapidly overloaded while others are undertasked.

The flight dispatch operation might be thought of as a production system with mission taskings as the input, dispatchers and dispatcher workstations as the transformation system, and safe and effective missions as the output. From a production system perspective, overloaded controllers might be thought of as a work pileup area, or bottleneck. A process bottleneck is a constraint that limits an entire system’s capacity (Meredith and Shafer, 1999:5). Under Griffin’s definition, this situation represents an unwise use of resources, and thus inefficiency. Achieving equal tasking of all personnel all the time—a perfectly efficient system—is a pipedream. Still, an IFM system aimed at minimizing inequities in workload distribution would reduce the chance of one overloaded controller or group of controllers becoming “process bottlenecks” and thus constraining the effectiveness and surge capability of the system. These workload inequities could be minimized either through the control of system input or creating “dual hatted” dispatchers that can easily move from position to position. As a military

operation, AMC and the TACC react to developments in the external environment, so control of system inputs is not a realistic option.

The challenge comes in selecting a structure that allows for the movement of personnel to increase efficiency, but still builds a core of specialization within its dispatcher corps. Adoption of the product line option with geographic subdivisions could create this balance. A variation of the product line based IFM facility as shown in Figure 4-2, illustrates this concept. The dispatch cells (all located in the same room) are divided into broad functional areas as described in Chapter 3. Each cell is further subdivided by specific functional area (e.g. channels only or air refueling only). Within each specific

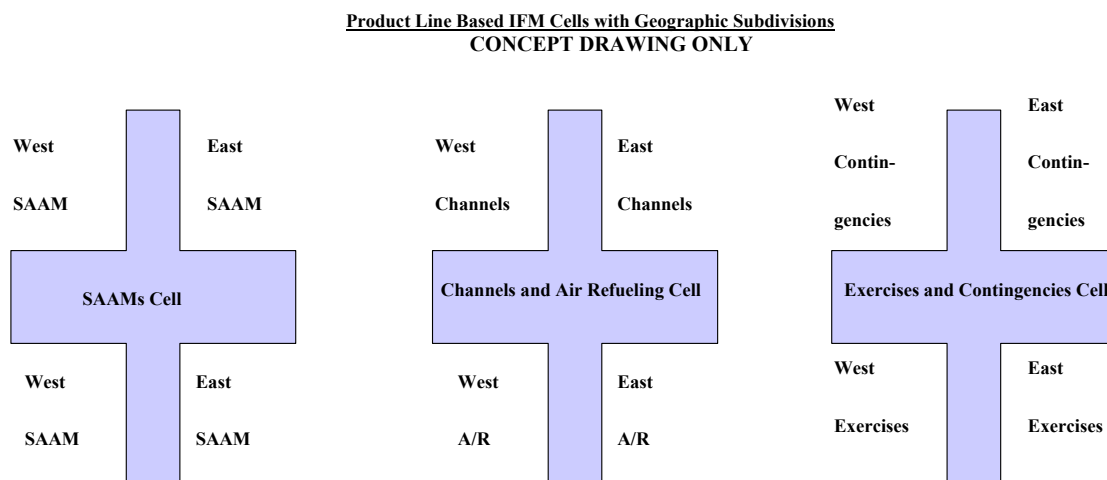


Figure 4-2

functional area is a dispatcher workstation representing a geographic subdivision, such as eastern channels or western air refueling. These dispatcher job assignments are similar to areas of specialization within the current TACC. The significant difference is that this proposal subdivides product line by geography while the current system subdivides geography by product line. This is an important point, because under the proposed

system the East and West Cells would be eliminated. The dispatchers controlling a particular product line would be seated next to each other. Dispatcher training and experience would focus on one product line, but both geographic areas. Dispatchers working the same product line would rotate between workstations on a regular basis to build familiarity with the operational considerations unique to each geographic area. Improved communication between controllers would result simply because of where they sat in the work environment. Most importantly, though, dispatchers could quickly and easily augment their “product line partner” during surge operations, and there would be no artificial “wall” behind which a particular group of dispatchers could become overtasked and constrain system throughput.

The efficiency and effectiveness decision frame, then, appears to portend a product line based organization with geographic subdivisions. It would provide an opportunity for the TACC to more evenly distribute workload among its dispatchers. This improved human resource efficiency would increase surge capability—and thus maximize throughput—on a system-wide basis. At the same time, it would build dispatcher expertise centered on mission type with a secondary emphasis on universal geographic knowledge. Although to a lesser degree, aircraft-specific knowledge would still develop based on the fact that aircraft design tends to favor a particular mission type.

Goal 3: The virtual crewmember. The term “virtual crewmember,” besides being coined and mentioned throughout the FEDSIM study, has been used in nearly every command briefing addressing M2K and implementation of the flight dispatch initiative. The term has not been precisely defined, but when discussed in the context of flight dispatch, most air crewmembers immediately understand its meaning. The word

“virtual” is defined as “being such in essence and effect though not formally recognized or admitted” (Merriam-Webster, 1990:1317). When linked with the word “crewmember,” this new term “virtual crewmember” aptly captures the essence of what AMC envisions the role of the dispatcher to be under M2K. Today’s aircrews consider themselves overworked, fatigued, and receiving minimal support from TACC (IFM Update, 2000:14). Because mission managers are commonly in a reactive mode and spend a great deal of their time chasing data, aircrews often view them as more of a hindrance than a help to effective mission accomplishment. With the implementation of IFM, this perception will change. With a multitude of resources at their disposal, TACC dispatchers will become a proactive single point of contact for AMC missions. In addition to lessening the aircrew workload, they will have the innate ability to anticipate events and assist the crew in preventing and resolving problems. No matter what phase a mission is in, the dispatcher—the virtual crewmember—will be there to help, not hinder the crew.

The dispatcher will form the cornerstone of the flight dispatch function—the sole link between the aircrew and the TACC. Thus, providing the resources necessary to turn the dispatcher into the best virtual aircrew member possible should be a major goal of the IFM system. Three significant factors that will contribute to the development of the virtual crewmember are equipment, training and expertise. To evaluate the “virtual crewmember” goal, the following paragraphs will consider how each of the aforementioned factors might be supported by the different organizational options.

Fortunately for TACC, AMC intends to provide full funding to acquire the necessary equipment for implementation of IFM operation in TACC. In fact, while

discussing the M2K initiatives in April, 1999, AMC Commander General Charles T. Robertson stated “A must do! Don’t waste another day!” This statement now appears at the beginning of numerous briefings and publication related to M2K. Based on this high level of commitment, it is expected that when the IFM function is implemented in the TACC, the necessary communications and command and control equipment needed to transform the dispatcher into a virtual crewmember will be in place. The dispatcher workstations will contain multiple user interfaces and multi-mode communications capability to allow rapid connectivity to AMC aircraft operating nearly anywhere in the world. In short, they will provide the real time command and control capability that is essential for a dispatcher to become a virtual crewmember. All workstations will have identical capability, and the capability of the dispatcher to use the equipment would probably not vary with the type of organizational structure used.

One limitation, however, may be apparent in the early stages of IFM. While the dispatch facility will have all the communications equipment it needs, retrofitting the entire AMC fleet of aircraft with the appropriate airborne communications capability will take several years. The airborne equipment will be installed in phases, beginning with the C-17 fleet and then moving through the other aircraft in the inventory. As a result, in the earliest phases of the flight dispatch operation, dispatchers will need to contend with differing communications capabilities between aircraft types and even between individual aircraft. An MDS oriented dispatch operation would tend to lend the greatest support to dispatchers during this transition phase by allowing them to concentrate on one type of aircraft and its unique communication capabilities. Since this period is temporary, though, it might be best not to organize the entire system around this one constraint. If

required, a dispatcher working several types of aircraft could probably learn in short order the unique communications capabilities of the aircraft under his or her control.

Newly-hired AMC dispatchers will already possess an FAA-issued dispatcher license obtained by completing an approved dispatch school and passing a standardized exam. Once they report to the TACC for work, they will begin a period of formal and on-the-job training to familiarize themselves with the AMC mission, the TACC equipment, and the command and control function. A highly effective training program will significantly enhance the propensity of a newly hired dispatcher to become a true virtual crewmember. Is there a specific IFM organizational structure that will best support the training function? This is a difficult question to answer because the training program for the final IFM function has not even been developed. Still, the product line with geographic subdivision structure discussed in the previous section might be a good starting point. By receiving on the job training in just one cell, new dispatchers would gain a fairly well rounded orientation to the entire AMC system. They would obtain an in-depth exposure to one or two particular mission areas in fairly short order, plus a worldwide geography perspective. Additionally, because every cell deals with every aircraft in the inventory in some way, the dispatcher would receive a broad aircraft exposure as well. Under the geographic system, the trainee would need to obtain training in all three cells to obtain a world-wide perspective, plus receive mission-specific orientation. Under the MDS-based system, the trainee would need to obtain training in all three cells to gain exposure to every aircraft in the AMC inventory. It appears, then, that the product line based system would best support an efficient and well-rounded dispatcher training program.

As discussed in Chapter 3, different organizational structures will tend to build system-wide experience and expertise with different areas of concentration. Which area of expertise is most critical to the dispatcher fulfilling his or her role as a virtual crewmember? Is it in depth systems knowledge or more universal aviation and mission knowledge? Colonel Padula believes that in a dispatcher possessing a proactive mindset, true universal aviation knowledge should be sufficient to create the virtual crewmember envisioned under IFM (Padula:2000). This researcher too tends to steer away from the need for in-depth systems knowledge. To begin with, no matter how in depth a dispatcher's aircraft knowledge is, it's unlikely that it would surpass the knowledge of the aircrew, who is experiencing the problem and seeing it first hand. If a unique in-flight maintenance problem occurred for which the aircrew needed outside assistance (and these situations are comparatively rare), the dispatcher would have at his or her disposal a team of experts from the AMC standardization and evaluation division, the logistics cells, industry representatives, and other agencies to help the aircrew troubleshoot and come up with a solution to the problem. In effect, the in-depth aircraft knowledge is already built into the system and can be accessed when needed. The more important skill from a virtual crewmember standpoint might be the dispatcher's ability to anticipate repercussions of the maintenance problem and take actions to download the aircrew's workload so they can concentrate on the most pressing issues. Consider for a moment a dispatcher who innately knew that an aircraft unable to obtain a full flap setting would need a longer stopping distance. Now suppose this knowledge prompted him to pre-screen and pre-coordinate potential alternate airfields with longer runways and transmit them via data link while the crew in the air attempted to fix the flap problem. In this

instance, crew workload and stress level would be greatly reduced by the dispatcher's role as a virtual crewmember. The crew would be immensely grateful for the dispatcher's proactive stance, and probably for his decision to step back and not interfere as they diagnosed the maintenance problem. On top of this they would be reassured by the fact that their dispatcher could rapidly connect them with multiple systems experts if the need arose.

The dispatcher hiring and training systems put in place under IFM will ensure TACC has a dispatcher corps that possesses a large degree of universal aviation knowledge. In the area of hiring, the draft Air Force Core Personnel Document (AFCPD) for the GS-12 dispatcher positions under IFM makes it clear that a large degree of universal aviation knowledge will be a prerequisite to employment as a TACC dispatcher. First of all, dispatchers will be experienced aviators themselves: "rated experience (pilot or navigator) is required to efficiently and effectively perform this job." Secondly, they will be expected to apply this background in all phases of their job: "Using rated aviator experience, [the dispatcher] proactively identifies any problems or issues that could impact missions and analyzes possible effects to determine appropriate corrective action" (AFCPD, 2000:1,3). In the area of training, the TACC dispatcher will have a civilian dispatch license, which ensures a basic level of training in both dispatch procedures and universal aviation knowledge. To reinforce this, the TACC dispatcher training program could include aircraft specific systems orientation.

So would the MDS oriented dispatch system foster dispatcher expertise on aircraft systems and thus enhance his or her value as a virtual crewmember? Absolutely, but if universal aviation knowledge is just as effective in accomplishing this goal, perhaps it

might be wiser to build dispatcher expertise in areas where the aircrew is less likely to have in-depth knowledge. A C-5 pilot might fly channel missions for years and never really understand the dynamics of the overall global channel system. Or a C-130 crew might never know that an austere African airfield is notorious for closing down due to unforecasted bad weather. Just like aircraft expertise, geographic and mission area expertise can enhance the dispatcher's effectiveness as a virtual crewmember. It's a given that TACC dispatchers will already possess universal aviation knowledge and will receive aircraft-specific training before assuming their duties. Therefore, by building dispatcher experience through a geographic or product line oriented system the TACC might produce a corps of extremely well rounded virtual crewmembers. In fact, adoption of the product line with geographic subdivision dispatch system might provide a good balance between the geographic and product line focus.

Program Goals Approach: Summary. This section discussed three principles—safety, efficiency and effectiveness, and the virtual crewmember—that have been identified as major goals of the TACC flight dispatch initiative. Each goal was then evaluated in isolation vis-a-vis the proposed dispatch systems and related competencies presented in Chapter 3. Each goal evaluation produced a “most favored” flight dispatch system.

The goal of flight safety was evaluated in light of the propensity of a given system to produce flight safety enhancements. The lack of any safety degradation was assumed for all systems. Based on the evaluation, the safety goal portends either a geographic or MDS oriented dispatch system.

Efficiency and effectiveness were intentionally tied together into one goal. As the TACC flight dispatch operation is built, efficiency and effectiveness should be thought of as synergic terms. A sufficiently efficient system will have inherent surge capability and will be less likely to create process bottlenecks that can limit throughput, and thus effectiveness. As it seeks efficiency, the TACC flight dispatch operation will have two primary resources at its disposal: dispatchers and dispatcher work stations. Other than location, the alteration of works stations is not considered an option because they all have essentially equal capability. Thus, efficiencies should be sought through the creation of worker flexibility and the proper distribution of workload among dispatchers. The goal evaluation revealed that adoption of the product line based dispatch system with the introduction of geographic subdivisions would have the greatest potential to enhance efficiency and effectiveness.

In contrast to the role of the current TACC mission manager, the flight dispatcher will be a proactive individual who assists the crew throughout every phase of a mission. He or she will anticipate problems or issues that could impact missions, analyze possible effects, and determine appropriate corrective action. In effect, the ideal dispatcher will be a “virtual crewmember.” The organizational alternatives for the flight dispatch operation were evaluated in relation to this virtual crewmember concept. It was assumed that the virtual crewmember will be a properly trained individual who possesses the appropriate equipment, and experience. The virtual crewmember concept was evaluated from the standpoint of each of these elements. The evaluation concluded that choice of dispatch system will not affect equipment capability. It was found that the dispatcher training would be effective under all systems, but most efficient under a product line oriented

system with geographic subdivisions. The evaluation considered dispatcher experience and its impact on the effectiveness of the virtual crewmember. While an MDS oriented system would build aircraft specific expertise, universal aviation knowledge could be just as useful in producing a virtual crewmember. Dispatcher training and hiring practices will make universal aviation expertise inherent in the dispatch system. Thus, it may be best to build experience in other areas as well. The adoption of a product line based system with geographic subdivisions would allow the dispatcher to maintain universal aviation expertise and also build a geographic and mission specific experience base. Overall, then, evaluation of the virtual crewmember goal portends the selection of product line based dispatch system with geographic subdivisions.

Summarizing the results of the goal evaluation, two of the three goals suggest adoption of a product line based organizational structure with geographic subdivisions. The other goal suggests a geographic or an MDS based structure. This result supports Whyte's contention that one's perception of the outcome of a decision will vary depending on the decision frame used to view that decision (Whyte, 1991:24). If an MDS oriented system is selected, for example, it might be seen from the safety decision frame as a good decision, but from an efficiency and effectiveness standpoint as a bad decision. The challenge now comes in selecting the one best organizational alternative and implementing it.

V Selecting the Best Alternative

Theoretical Background

In considering the flight dispatch function under the IFM initiative, this GRP has focused on developing a framework for accomplishing the first three steps in the rational decision making process. The final three steps in the process are selecting the best alternative, implementing the chosen alternative, and following up and evaluating the results. When selecting the best alternative the decision maker must “consider all situational factors and choose the alternative that best fits the...situation.” Following selection, the alternative is implemented into the organizational system. At some point after implementation, the manager should “ascertain the extent to which the alternative chosen...has worked” (Griffin, 1999:270).

The final chapter of this GRP includes process recommendations for selecting the best IFM organizational structure. Additionally, it applies the process to formulate a structural recommendation if its own. The process of selecting the final “real world” alternative, implementing it, and accomplishing follow-up and evaluation will be left to AMC leaders.

Griffin describes choosing between two or more feasible, satisfactory and affordable alternatives, as “the real crux of decision making.” He adds that most decision situations do not lend themselves to objective, mathematical analysis. In this case, the manager can often develop subjective estimates and weights for choosing alternatives. Another approach is for the decision maker to use optimization—that is finding the

alternative that provides the optimal balance of benefits even though it may not fully satisfy all goals (Griffin, 1999:273).

Alternative Selection Process

Certainly, the choice between organizational alternatives for the flight dispatch operation does not lend itself to “objective, mathematical analysis.” As a result, the final decision must be reached using subjective methodology.

Chapter 4 identified three criteria TACC leaders might use in making the final decision regarding organization of the flight dispatch system. All criteria are defined in terms of major program goals. The researcher arrived at these criteria through personal judgement, numerous interviews and review of most of the existing literature and briefings that address the topic of M2K. Thus, he believes the system goals of safety, efficiency and effectiveness, and creating a virtual crewmember are the primary frames of reference through which a final decision should be made. This being said, further analysis is still needed. First, TACC decision makers should re-evaluate the criteria using the same methodology employed in Chapter 4 to confirm stability of preferences. Next, they should discuss whether any more criteria should be evaluated. Finally, they should develop a subjective weighting or optimization system for selecting the best alternative.

As mentioned above, it is important that the criteria or goals discussed in Chapter 4 be reevaluated. This reevaluation would bring into the analysis inputs from an ad hoc panel of experts who approach the issue from a totally different frame of reference than the researcher. Perhaps there are major issues or constraints that are real, but have not been identified in the literature that was reviewed for this project. Each evaluator would

add additional frames of reference to the decision making process. A broad stability of preferences across these different frames would, in Whyte's words, "suggest that it is the potential outcomes of the decision that are dictating choice, rather than the frame adopted" (Whyte, 1991:29). The reevaluation of results need not be a lengthy process. It could take the form of a brainstorming session, or better yet several individuals performing a mental evaluation of the decision criteria and making their own recommendation. A comparison of the different recommendations could then be made to look for stability of preferences.

After the criteria have been re-evaluated, TACC decision makers should consider whether other goals or peripheral issues *are of sufficient weight* to be considered decision criteria. The threshold of what does and does not constitute sufficient weight will, of course be arbitrary and vary with who is making the judgement. In a section entitled "TACC goals and objectives in organizational terms," the FEDSIM study lists over 30 issues surrounding TACC and the IFM initiative that could be considered for inclusion as criteria. Considering every one of these a decision criterion, though, would lead to a very lengthy evaluation process and produce so many reference frames that reaching a final consensus would prove very difficult. This project strove to narrow the number of goals under consideration as much as possible. The "macro goals" were selected in part because they encompassed several more minor goals. The "create a virtual crewmember" goal, for example, addresses in some manner or form all of the following smaller goals listed by FEDSIM under "aircrew issues:"

- The ability to touch the crew at any time, both verbal and text
- I don't want to hear "I don't have time to deal with that" from a controller

- Shorten the show-to-go-process
- I don't want to be a C-17 Aircraft Commander—its too much work
- We need someone at the end of the line who can help us
- I exhaust my resources before turning to TACC
- Lack of confidence in the flight plan (FEDSIM, 1999:5-6)

The virtual crewmember will have real time connectivity with the crew, will have time to deal with aircrew issues, will reduce aircrew workload and thus shorten show to go times, will produce an accurate flight plan, and will be someone the crew *wants* to turn to for assistance.

In addition to goals, it might be useful to consider certain peripheral issues for inclusion as criteria. In this situation, a peripheral issue is considered something that might be affected by the choice of organizational structure, but is not an end to which the IFM effort is directed. It's important to select issues with far-reaching implications that might be cause per se for organizing the dispatch system in a particular manner. An example of a peripheral issue is "variable ground times" (Padula, 2000). Required ground times around the AMC system vary with crew complement and mission type. A product line based system might breed the most familiarity with variable ground time requirements. A proactive dispatcher, however, would probably be able to learn the idiosyncrasies of variable ground times. Accordingly, in the context of this GRP "variable ground times" was rejected as decision criterion for the entire flight dispatch system.

If any goals or issues are considered sufficiently important to qualify as additional decision criteria, they should be evaluated using the process discussed in Chapter 4. Then, they should be included as additional reference frames from which a final decision on organization of the flight dispatch system can be made.

Once the criteria identified in this study have been reevaluated, and additional criteria (if any) added, the decision makers must develop a weighting or optimization system to arrive at a final recommendation. Like the other steps in the decision making process, this one is subjective as well. If the final number of decision criteria remains small like it is now, optimization might represent a better approach than weighting.

Optimization involves finding a balance of benefits with the knowledge that all benefits may not be equally satisfied. To select an organizational structure for the flight dispatch system using this process, decision makers might proceed as follows. First identify each decision criteria and link it with the organizational structure it portends. Next, evaluate the criteria that are not being satisfied under each option and discuss the *degree* to which it is not satisfied and the importance of those criteria relative to the others. Finally select the option that provides the optimal balance between benefits.

The Process Applied

The process described above can be applied to draw a final organizational recommendation based solely on the data provided in this GRP. Table 5-1 summarizes the organizational recommendations arrived at in Chapter 4. It lists the goals which were selected as decision frames, along with the preferred organizational structure for each that was arrived at through the evaluation process. As the table shows, if all goals are given equal weight, the selection of the product line option would provide with the best optimization of benefits. Now that the “equal weight” choice has been made, the safety goal can be looked at again. How important are the safety benefits that will be lost under the product line system relative to the other goals? In the researcher’s mind, the fact that

Summary of Preferred Organizational Structure by Program Goal

Goal	Geography Preference	Product Line Preference	MDS Preference
Safety	XX		XX
Efficiency Effectiveness		XX	
Virtual Crewmember		XX	

Table 5-1

the expected safety benefits identified in chapter 4 represent only *potential* improvements in the ability of the dispatcher to provide better weather and flight planning support tend to weaken the value of the safety goal. Additionally, the introduction of a product line based system with geographic subdivisions would provide some degree of geographic specialization and help make up for the benefits lost by the non-selection of the geography only option. So this optimization process concludes that the selection of a product line based system with geographic subdivisions will provide the optimal flight dispatch operation when safety, efficiency and effectiveness, and the virtual crewmember concept are used as the primary decision criteria.

Summary and Conclusions

This Graduate Research Project has discussed and evaluated alternative organizational structures for the Tanker Airlift Control Center (TACC) flight dispatch operation in the framework of the Rational Decision Making Model. The first step in the model is recognizing and defining the decision situation. Chapter 2 defined the decision situation by presenting and discussing the historical evolution of the TACC.

Additionally, it presented future challenges that have been the impetus for the Mobility 2000 initiative, and with it the integrated flight management concept. The second step in

the model is identifying alternative courses of action. Chapter 3 applied this step by introducing three proposed organizational structures for the TACC flight dispatch operation, which forms the cornerstone of Integrated Flight Management. The third step in the Rational Decision Making Model is evaluating alternatives. Chapter 4 evaluated the alternatives by applying Whyte's method of employing multiple decision frames. Three major goals of the flight dispatch system were used as decision frames—points of reference from which a decision can be made. The three goals—safety, efficiency and effectiveness, and the virtual crewmember—were presented as decision criteria to be used in making the final choice of organizational structure. Each goal of the flight dispatch operation was evaluated in reference to each criterion. The fourth step in the Rational Decision Making Model is selecting the best alternative. Chapter 5 proposed a qualitative process for selecting the final organizational structure of the TACC flight dispatch operation. It then applied the process to the findings in this study, and presented the results. Steps 5 and 6 of the Rational Decision Making Model are implementing the chosen alternative and following up and evaluating the results. These steps will need to be carried out by AMC leaders after a final organizational decision is made.

This study suggests that a product line based organization with geographic subdivisions would optimize goal accomplishment for the TACC flight dispatch operation. At the same time, it recognizes the subjective nature of the alternative selection process. For this reason, it recommends that as TACC leaders move closer to a final organizational decision, they give greater weight to the application of the discussed decision making frameworks than to the outright adoption of any specific proposal.

Appendix A: Acronyms

ACC	Air Combat Command
AMC	Air Mobility Command
AOC	Air Operations Center
AOR	Area of Responsibility
C2	Command and Control
CONUS	Continental United States
FAA	Federal Aviation Administration
FEDSIM	Federal Systems Integration and Management Center
GATM	Global Air Traffic Management
GDSS	Global Decision Support System
GPS	Global Positioning Position
GRP	Graduate Research Project
ICAO	International Civil Aviation Organization
IFM	Integrated Flight Management
M2K	Mobility 2000
MAC	Military Airlift Command
MDS	Mission, Design, Series (aircraft type, e.g. B-1, C-5, etc.)
MEDEVAC	(Aero) Medical Evacuation
MOG	Maximum on Ground
NAF	Numbered Air Force
NOTAMS	Notices to Airmen
SAAM	Special Assignment Airlift Mission
SAC	Strategic Air Command
TAC	Tactical Air Command
TACC	Tanker Airlift Control Center

Bibliography

Air Mobility Command. AMC Command and Control (C2) Responsibilities and Procedures. AMC Instruction 10-202, Vol 2. Scott AFB, IL: Headquarters, Air Mobility Command, 15 September, 1995.

Air Mobility Command. Tanker/Airlift Operations. AMC Instruction 11-208. Scott AFB, IL: Headquarters, Air Mobility Command, 20 January 2000.

Air Mobility Command: 1998 Air Mobility Master Plan. (AMMP) with 1999 revisions. Scott AFB, IL: Headquarters, Air Mobility Command, 1998, 1999.

Becker, John. Commander, Tanker Airlift Control Center. Headquarters, Air Mobility Command, Scott AFB. IL. Electronic mail correspondence. 3 November 1999.

Draft Air Force Core Personnel Document, Flight Management Specialist Position. Tanker Airlift Control Center Directorate of Command and Control. Headquarters, Air Mobility Command, Scott AFB, IL.

Federal Systems Integration and Management Center (FEDSIM). AMC Corporate Systems Analysis, Design , and Implementation PEP 18 TACC Project. Falls Church, VA: Federal Systems Integration and Management Center, April, 1999.

U.S. Department of Transportation, Federal Aviation Administration (USDOT/FAA). Airline Operational Control Overview: FMS-ATM Next Generation (FANG) Team. Washington: U.S. Department of Commerce National Technical Information Service, July, 1997.

Grandeau, Seth C., Michael D. Clark, and Dennis F. X. Mathaisel. "The Process of Airline Systems Operational Control" in Operations Research in the Airline Industry. Ed. Gang Yu. Boston, MA: Kluwer Academic Publishers, 1998.

Duquette, Michelle A. Vice President of Operations, Airline Dispatcher's Federation and Flight Specialist, Federal Express Global Operations Center, Memphis, TN. Electronic Mail Correspondence 23 May, 2000.

Griffin, Ricky W. Management, 6th Edition. Boston: Houghton Mifflin Company, 1999.

Hanbey, Glenn T. Deputy Director of Operations, Tanker Airlift Control Center. Headquarters, Air Mobility Command, Scott AFB, IL. Electronic mail correspondence. 6 June 2000.

Kennedy, Kari. Dispatcher, Trans World Airlines, St. Louis, MO. Telephone interview. 5 June 2000.

Leland, John W. "Interview with Colonel Daryl L. Bottjer, Director of Current Operations, Tanker Airlift Control Center." Air Mobility Command Office of History, Scott AFB, IL (December, 1992).

Libsch, Debra. Aeromedical Evacuation Duty Controller, Tanker Airlift Control Center. Headquarters, Air Mobility Command, Scott AFB, IL. Telephone Interview. 5 June 2000.

Meredith, Jack R. and Scott M. Shafer. Operations Management for MBAs. New York: John Wiley and Sons, Inc, 1999.

Mobility 2000 IFM Update. Tanker Airlift Control Center briefing obtained through Lt Col Glenn Hanbey, Tanker Airlift Control Center Directorate of Command and Control. Headquarters, Air Mobility Command, Scott AFB, IL. 22 May 2000.

Padula, Greg. Director of Operations Management, Tanker Airlift Control Center. Headquarters, Air Mobility Command, Scott AFB, IL. Personal interview. 24 May 2000.

Porter, David. Operations Services Manager, Delta Airlines, Atlanta, GA. Personal interview conducted at Scott AFB, IL. 24 May 2000.

Payne, John G. A Comparative Study of KC-135 Operations in Vietnam, Desert Storm, and Allied Force. Masters Graduate Research Project, AFIT/GMO/ENS/00E-08. Graduate School of Engineering and Management, Air Force Institute of Technology (AU), Wright-Patterson AFB, OH, June, 2000.

Raska, Vincent. MAJCOM Regional Operations Director, Tanker Airlift Control Center. Headquarters, Air Mobility Command, Scott AFB, IL. Personal interview. 24 May 2000.

Rubalcaba, David. "Unrestricted Global Mobility Through Global Air Traffic Management." The Mobility Forum: 18-21 (May, 1997).

Rummer, James. Director of Command and Control, Tanker Airlift Control Center. Headquarters, Air Mobility Command, Scott AFB, IL. Personal interview. 24 May 2000.

Tanker Airlift Control Center Overview Briefing. Tanker Airlift Control Center briefing obtained through Maj Vincent Raska, Tanker Airlift Control Center Directorate of Command and Control. Headquarters, Air Mobility Command, Scott AFB, IL. 30 May 2000.

U.S. Air Force Almanac, 1991. Air Force Magazine, 74: 85-88, 93-95 (May, 1991).

U.S. Air Force Almanac, 1992. Air Force Magazine, 75: 64-66, 69-71 (May, 1992).

U.S. Air Force Almanac, 1995. Air Force Magazine, 78: 86-89 (May, 1995).

Webster's 9th New Collegiate Dictionary. Springfield, MA: Merriam-Webster, Inc, 1990.

Williams, Terry, Greg Padula and John Becker. "Mobility 2000." Briefing at the Airlift/Tanker Association Annual Convention and Symposium. Adams Mark Hotel and Convention Center, Dallas, TX. 5 and 6 November 1999.

Wooley, Michael. Commander, Tanker Airlift Control Center. Headquarters, Air Mobility Command, Scott AFB. IL. Personal interview conducted at McGuire AFB, NJ. 12 May 2000.

Whyte, Glen. "Decision Failures: Why They Occur and How to Prevent Them." Academy of Management Executive, 5: 23-31 (August, 1991).

Vita

Major Jeffrey A. Sheppard was born in Junction City, Kansas. He graduated from Le Sueur High School in Le Sueur, Minnesota in June, 1980. He subsequently enlisted in the Air Force. His first permanent duty assignment was Norton AFB, California, where he served in the aircraft maintenance career field and attained the rank of Staff Sergeant. In June 1984, he left active duty to enter the Air Force Reserve Officer Training Corps at the University of Northern Colorado. He was commissioned in June, 1987 and recognized as a Reserve Officer Training Corps Distinguished Graduate.

His first assignment as an officer was to Specialized Undergraduate Navigator Training. In May, 1989 he was assigned to Beale AFB, California, where he held positions as navigator, instructor navigator, evaluator navigator, and operations scheduler. In 1994 he was transferred to Grand Forks AFB, North Dakota, where he served as Chief, Squadron Standardization and Evaluation, Flight Commander, Group Standardization and Evaluation Navigator, Group Executive Officer and Wing Executive Officer. In 1999, he was competitively selected for the Advanced Study of Air Mobility program at the Air Mobility Warfare Center, Fort Dix, New Jersey.

He has accumulated more than 2,700 flying hours and has flown in support of Operations DESERT SHIELD, DESERT STORM, SOUTHERN WATCH and NORTHERN WATCH.

REPORT DOCUMENTATION PAGE				Form Approved OMB No. 074-0188	
<p>The public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of the collection of information, including suggestions for reducing this burden to Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports (0704-0188), 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.</p> <p>PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ADDRESS.</p>					
1. REPORT DATE (DD-MM-YYYY) Oct 03		2. REPORT TYPE		3. DATES COVERED (From – To) Jan 99- Jan 00	
4. TITLE AND SUBTITLE OPTIONS FOR ORGANIZING THE TANKER AIRLIFT CONTROL CENTER FLIGHT DISPATCH FUNCTION: AN EXPLORATORY CONCEPT STUDY				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S) Jeffrey A. Sheppard, Major, USAF				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAMES(S) AND ADDRESS(S) Air Force Institute of Technology Graduate School of Engineering and Management (AFIT/EN) 2950 Hobson Street, Building 640 WPAFB OH 45433-7765				8. PERFORMING ORGANIZATION REPORT NUMBER AFIT/GMO/ENS/00E-10	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT APPROVED FOR PUBLIC RELEASE; DISTRIBUTION UNLIMITED.					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT <p>The Tanker Airlift Control Center (TACC) is the central execution agency for determining and tasking all AMC operational mission requirements. Central to the TACC is the mission management function that organizes plans, directs and controls AMC airlift and air refueling missions worldwide. As it moves into the future, TACC must adopt emerging capabilities in communication, navigation, and surveillance to allow it to continue to freely operate through out the world air traffic system. To position itself for future operations, the TACC has implemented the Mobility 2000 initiative, a key element of which is the planned introduction of Integrated Flight Management, or IFM. Central to IFM will be the introduction of the flight dispatch function-a proactive, real time command and control system patterned after that used by commercial airlines. At this time, TACC leaders are unsure whether to organize the future flight dispatch operation based on geography, product line or aircraft type. This Graduate Research Project explores these organizational options, and specifically seeks to identify criteria that TACC can use in deciding on a final organizational structure. To assist in this process, it evaluates the organizational issues in the context of the Rational Decision Making Model as Discussed by Griffin.</p>					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT UU	18. NUMBER OF PAGES 77	19a. NAME OF RESPONSIBLE PERSON Stephen P.Brady, Lt Col, USAF (ENS)
REPORT U	ABSTRACT U	c. THIS PAGE U			19b. TELEPHONE NUMBER (Include area code) (937) 255-6565, ext 44367; e-mail: Stephan.brady@afit.edu

Standard Form 298 (Rev: 8-98)